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Original

Installation, Operation and Maintenance Manual

Satellite Communication System

Alaska Region Research Vessel (ARRV)

R/V Sikuliaq

Marinette Marine Corporation
Fincantieri Marine Group
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Marinette, WI 54143

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RECORD OF CHANGES

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-	5-01-11	INITIAL ISSUE	JV

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FOREWORD

THIS MANUAL IS INTENDED TO CLEARLY AND ACCURATELY REFLECT THE ACTUAL CONFIGURATION OF THE INSTALLED EQUIPMENT AND PROVIDE THE USER WITH THE NECESSARY INSTRUCTIONS TO SUCCESSFULLY OPERATE, MAINTAIN, AND TROUBLESHOOT ASSOCIATED EQUIPMENTS. THE MANUAL IS CONSTRUCTED AS FOLLOWS:

- **C-BAND TX/RX ANTENNA MANUAL**
  - **TABLE OF CONTENTS**
  - **INTRODUCTION**
  - **OPERATION**
  - **BASIC SYSTEM INFORMATION**
  - **INSTALLATION**
  - **SETUP**
  - **FUNCTIONAL TESTING**
  - **MAINTENANCE AND TROUBLESHOOTING**
  - **TECHNICAL SPECIFICATIONS**
  - **DRAWINGS**

CONFIGURATION

THE FOLLOWING PIECES OF EQUIPMENT ARE THE MAJOR PARTS OF THIS SYSTEM.

- **C-BAND TX/RX ANTENNA – 9797B-70**

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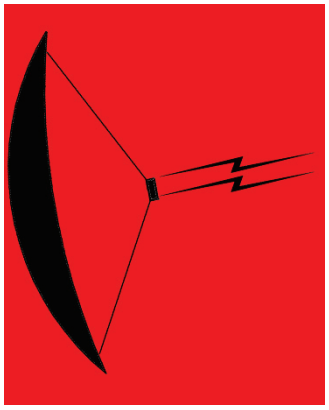
INSTALLATION AND OPERATION MANUAL
FOR SEA TEL MODEL
9797B-70 C-BAND TX/RX ANTENNA



WARNING: RF RADIATION HAZARD

This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system. Prior to work on the stabilized antenna system, the power to the transmit/receive system must be locked out and tagged.

When the transmit/receive system is in operation, no one should be allowed **anywhere within the radiated beam** being emitted from the reflector.

The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.

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Sea Tel Inc doing business as Cobham SATCOM		

January 6, 2010 **Document. No. 128411 Revision B**

These commodities, technology or software were exported from the United States in accordance with the Export Administration Regulations. Diversion contrary to U.S. law is prohibited.

Sea Tel Marine Stabilized Antenna systems are manufactured in the United States of America.

Sea Tel is an ISO 9001:2000 registered company. Certificate Number 19.2867 was issued August 12, 2005. Sea Tel was originally registered on November 09, 1998.

R&TTE

CE

The Series 97 Family of Marine Stabilized Antenna Pedestals with DAC-97 Antenna Control Unit complied with the requirements of European Norms and European Standards EN 60945 (1997) and prETS 300 339 (1998-03) on July 20, 1999. Sea Tel document number 119360 European Union Declaration of Conformity for Marine Navigational Equipment is available on request.

This Sea Tel Ku Band antenna will meet the spectral density, stabilization accuracy and, when properly connected to the modem, the automatic cessation of transmission requirements of the 2009 version of FCC 47 C.F.R. § 25.222. Please refer to the declaration included in this manual.

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Revision History

REV	ECO#	Date	Description	By
A	N/A	March 19, 2009	Initial Release	ECM
A1	N/A	April 28, 2009	Updated font and logo.	MDN
B		January 6, 2010	Add GSR2 software information	MDN

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R&TTE Declaration of Conformity

Doc Number 128482 Revision B

Sea Tel Inc. declares under our sole responsibility that the products identified below are in conformity with the requirements of:

DIRECTIVE 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

Product Names: **Series 97 C Band Tx/Rx Maritime Satellite Earth Station.**

The products have been assessed to Conformity Procedures, Annex IV, of the above Directive by application of the following standard(s):

EMC:	**ETSI EN 301 489-1 V1.4.1 (2002-08)** **prETS 300 339 (1998-03)**
Marine Navigational Equipment – General Requirements:	**IEC EN 60945:1997**
Satellite Earth Stations and System (SES); Harmonized EN for Very Small Apperature Terminals (VSAT):	**ETSI EN 301 443-1 V1.3.1 (2006-02)**
Harmonized EN for satellite Earth Stations on board Vessels (ESVs)	**ETSI EN 301 447 V1.1.1 (2007-08)**
Safety of information technology equipment:	**IEC EN 60950-1:2001 (1st Edition)**

Certificates of Assessment were completed and are on file at NEMKO USA Inc, San Diego, CA

Sea Tel, Inc
Concord, CA

2/19/09

Peter Blaney, Chief Engineer Date

Sea Tel®

Marine Stabilized Antenna Systems

Declaration of Sea Tel, Inc.

I, Peter G. Blaney, Vice President of Engineering for Sea Tel, Inc. ("Sea Tel"), hereby declare, under penalty of perjury, that the following statements are true and correct:

1. Sea Tel designs, develops, manufactures and services marine stabilized antenna systems for satellite communications at sea. MTN, Inc. proposes to use the following Sea Tel's antenna systems as part of its C and Ku-band Earth Station on Vessels ("ESV") networks: Model 4996T, Model 4003A, Model 4006 Model 9697 and Model 9797.
2. For C band operations, when the input power to the antenna system is limited to –2.7 dBW/4kHz as specified in FCC, 47 C.F.R § 25.212 (d), the off-axis EIRP spectral density side-lobe envelope set forth in FCC, 47 C.F.R. § 25.221(a)(1)-(4) will be met.
3. For Ku band operations, when the input power to the antenna system is limited to –17 dBW/4kHz, the off-axis EIRP spectral density side-lobe envelope set forth in FCC, 47 C.F.R. § 25.222(a)(1)-(4) will be met.
4. The Sea Tel antennas referenced in paragraph 1 will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions. New software has recently been developed to continuously monitor the instantaneous pedestal pointing error and will trip an error flag whenever an unexpected event occurs that causes the pointing error to exceed 0.5 degrees. The flag will not clear until the pedestal error decreases to 0.2 degrees or less. This flag is used to control the "Transmit Mute" output function of the Sea Tel below decks controller. The response time from pointing error occurrence to "Mute" output is 50 milliseconds nominal.. By connecting the "Transmit Mute" output of the Sea Tel below decks controller to the "Mute Input" of the satellite modem, the provisions of FCC, 47 C.F.R. § 25.221(a)(7) and 47 C.F.R. § 25.222(a)(7) are satisfied.
5. Sea Tel maintains all relevant test data, which is available upon request, to verify these declarations.

Executed on: _____

By: _____

Peter G. Blaney
Vice President, Engineering
Sea Tel, Inc.

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1. Introduction

WARNING: *RF Radiation Hazard - This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system.*

The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.

1.1. General System Description

Your Series 97 system is a fully stabilized antenna that has been designed and manufactured so as to be inherently reliable, easy to maintain, and simple to operate. Except for start-ups, or when changing to operate with different transponders or satellites, the equipment essentially permits unattended operation.

1.2. Purpose

This shipboard Transmit-Receive (TXRX) system provides you with two-way satellite voice/data communications while underway on an ocean-going vessel. This can be used to provide a wide variety of telephone, fax and data applications. Your Series 97 Antenna system can transmit to and receive from any desired satellite which has adequate signal coverage in your current geographic area. Your Series 97 antenna may be fitted with appropriate Transmit & Receive RF Equipment and appropriate Feed to allow you to operate in linear or circular polarization mode at C-Band frequencies. This input will be distributed to your satellite modem and then to all of your other below decks equipment.

1.3. System Components

The Series 97 TXRX system consists of two major groups of equipment; an above-decks group and a below-decks group. Each group is comprised of, but is not limited to, the items listed below. All equipment comprising the Above Decks is incorporated inside the radome assembly and is integrated into a single operational entity. For inputs, this system requires only an unobstructed line-of-sight view to the satellite, Gyro Compass input and AC electrical power.

For more information about these components, refer to the Basic System Information section of this manual.

A. Above-Decks Equipment (ADE) Group
   1. Stabilized antenna pedestal
   2. Antenna Reflector
   3. Feed Assembly with LNB(s)
   4. Separate C-Band and Ku-Band Radio Packages
   5. Separate C-Band and Ku-Band High Power Amplifiers
   6. Radome Assembly

B. Below-Decks Equipment Group
   1. Antenna Control Unit
   2. Splitter with desired number of outputs (one output to the ACU and one output to the Satellite Modem are required).
   3. Satellite Modem and other below decks equipment required for the desired communications purposes.
   4. Spectrum Analyzer (Optional)
   5. Control, RF and Other cable connections

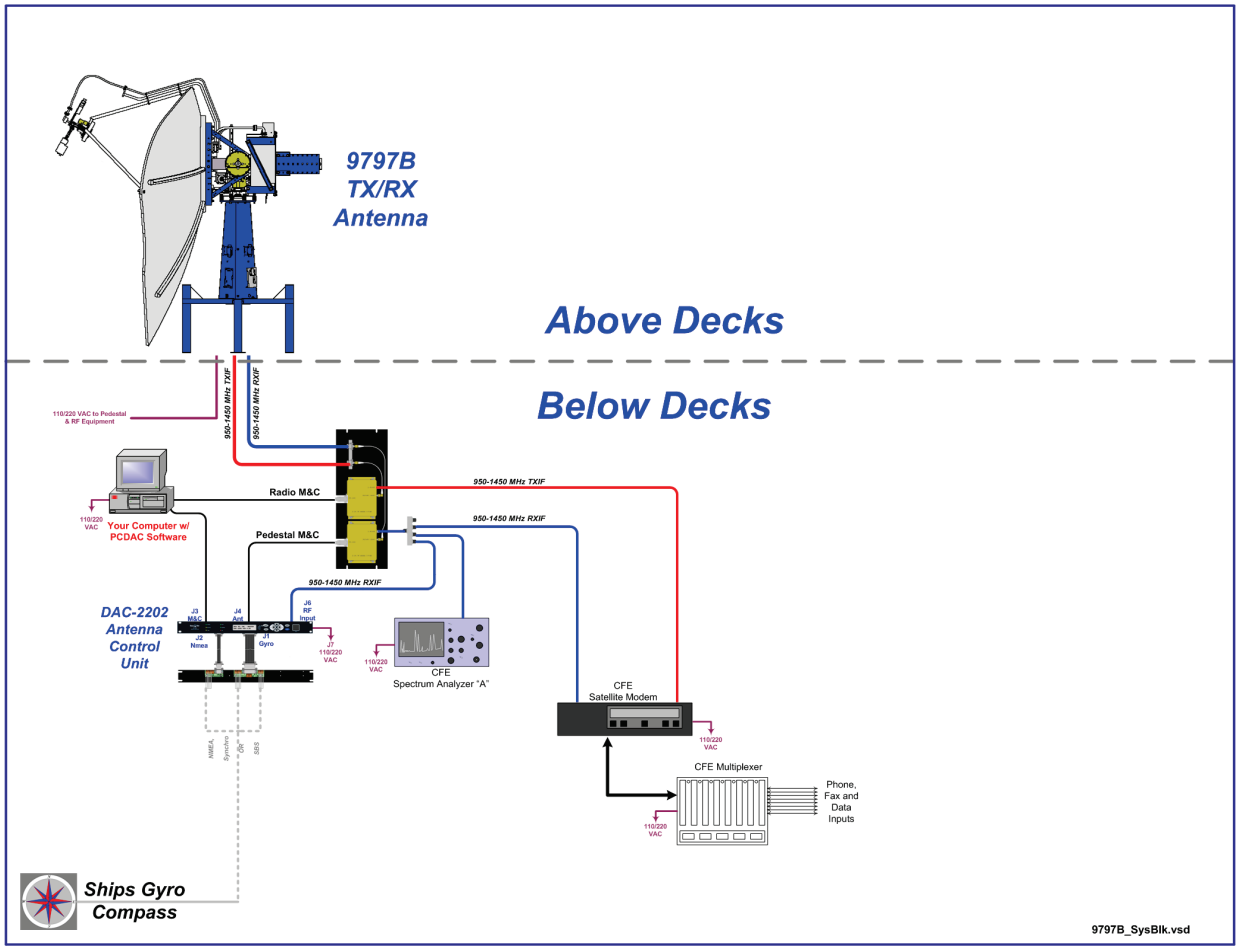

Figure 1-1 Series 97 TXRX Simplified Block Diagram

1.4. General scope of this manual

This manual describes the Sea Tel Series 97 Antenna (also called the Above Decks Equipment), its' operation and installation. Refer to the manual provided with your Antenna Control Unit for its' installation and operating instructions.

1.5. Quick Overview of contents

The information in this manual is organized into chapters. Operation, basic system information, installation, setup, functional testing, maintenance, specifications and drawings relating to this Antenna are all contained in this manual

2. Operation

	WARNING: *RF Radiation Hazard - This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**
	WARNING: *RF Radiation Hazard - When the transmit/receive system is in operation, no one should be allowed anywhere within the radiated beam being emitted from the reflector.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**

2.1. System Power-up

Turn the Power switch on the louvered panel of the antenna pedestal ON. This will energize the antenna pedestal and the associated RF equipment.

Turn the Power switch on rear panel of the Antenna Control Unit (ACU) ON.

2.2. Antenna Initialization

A functional operation check can be made on the antenna stabilization system by observing its behavior during the 4 phases of initialization.

Turn the pedestal power supply ON. This will release the elevation and cross-level bakes and then the PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps (listed below) to initialize the antenna. These phases initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions.

Initialization is completed in the following phases, each phase must complete properly for the antenna to operate properly (post-initialization).

1. Level Cage is driven CCW, issuing extra steps to assure that the cage is all the way to the mechanical stop. Then the Level cage will be driven exactly 45.0 degrees CW.
2. Elevation axis activates - Input from the LV axis of the tilt sensor is used to drive the Elevation of the equipment frame to bring the tilt sensor LV axis to level (this results in the dish being at an elevation angle of 45.0 degrees).
3. Cross-Level axis activates - Input from the CL axis of the tilt sensor is used to drive Cross-Level of the equipment frame to bring the cross-level axis of the tilt sensor to level (this results in the tilt of the Cross-Level Beam being level).
4. Azimuth axis activates - Antenna drives in azimuth until the “Home Flag” signal is produced. This signal is produced by a Home Switch hitting a cam or by a Hall Effect sensor in close proximity to a Magnet.

This completes the phases of initialization. At this time the antenna elevation should 45.0 degrees and Relative azimuth should be at be at home flag (home switch engaged on the home flag cam).

If any of these steps fail, or the Antenna Control Unit reports model number as "xx97(A/B)" re-configure the PCU as described in section the Setup section of this manual. If initialization still fails, refer to the troubleshooting section of this manual.

2.3. Antenna Stabilization

After initialization has completed, real-time stabilization of the antenna is an automatic function of the PCU.

2.4. Stabilized Pedestal Assembly Operation

Operation of the stabilized antenna Pedestal Control Unit (PCU) is accomplished remotely by the Antenna Control Unit (ACU). Refer to the Operation section of the Antenna Control Unit manual for more specific operation details. There are no other operating instructions applicable to the pedestal assembly by itself.

2.5. Tracking Operation

Tracking optimizes the antenna pointing, in very fine step increments, to maximize the level of the satellite signal being received. The mode of tracking used in this antenna is a variation of Conical Scanning called DishScan.

DishScan continuously drives the antenna in a very small circular pattern at 60 RPM. The ACU evaluates the received signal throughout each rotation to determine where the strongest signal level is (Up, Right, Down or Left) and issues the appropriate Azimuth and/or Elevation steps to the antenna, as needed.

You cannot control tracking from the pedestal itself. Refer to the ACU manual for tracking operation information.

2.6. Antenna Polarization Operation

Your Scalar Plate assembly is equipped with a polarization motor and potentiometer feedback that are controlled from the Antenna Control Unit. This allows you to have a Linear, or a Circular, feed assembly installed on your antenna.

When you have a Circular feed installed, polarization adjustment. is NOT required. You should set the POL TYPE parameter in your ACU to 0000.

When you have a Linear feed installed, polarization may be operated manually from the ACU but Auto-Polarization mode is the default polarization mode of operation from the ACU and is strongly recommended (set POL TYPE parameter in your ACU to 0072). Refer to the Antenna Control Unit manual for more operation information.

2.7. Low Noise Block Converter Operation

There are no operating instructions or controls applicable to the LNB. This unit is energized by the ACU (or by the pedestal modem on some systems).

2.8. RF Equipment

The RF Equipment is not operated or controlled by the antenna pedestal or Antenna Control Unit. Refer to the vendor supplied manuals for the RF Equipment provided with your system.

2.9. Radome Assembly Operation

When operating the system it is necessary that the radome access hatch (and/or side door) be closed and secured in place at all times. This prevents rain, salt water and wind from entering the radome. Water and excessive condensation promote rust & corrosion of the antenna pedestal. Wind gusts will disturb the antenna pointing.

There are no other operating instructions applicable to the radome assembly by itself.

3. Basic System Information

This section provides you with some additional information about the satellites you will be using, basics of your Series 97B antenna system and some of the other equipment within your system configuration.

3.1. Satellite Basics

The satellites are in orbit at an altitude of 22,754 miles and are positioned directly above the equator. Their orbital velocity matches the Earth's rotational speed, therefore, each appears to remain at a fixed position in the sky (as viewed from your location).

Your antenna can be used with any of the satellites in this orbit that have a strong enough receive signal level. Your antenna is capable of being fitted with a Linear or Circular feed assembly. The feed may be designed to operate at C-Band frequencies, Ku-Band frequencies or be capable of operation in both bands. With the correct feed assembly you will be able to receive the linear or circular signal at the specific frequency range of the desired satellite.

3.1.1. C-Band Receive Frequency (3.625-4.2GHz)

At these frequencies the signal from the satellite travels only in a straight line and is affected by weather changes in the atmosphere. There are several conditions that can cause a temporary loss of satellite signal, even within an area where the signal level is known to be adequate. The most common of these *normal* temporary losses are **blockage** and **rain fade**. They will interrupt services only as long as the cause of the loss persists.

3.1.2. Blockage

Blockage is loss due to an object in the path of the signal from the satellite to the dish. If an object that is large and dense is positioned in the path of the signal from the satellite, it will prevent sufficient signal from arriving at the dish. The signal can not bend around, or penetrate through, these objects and the reception will be degraded or completely interrupted. The dish is actively driven to remain pointed at the satellite (toward the equator) so, as the ship turns a mast or raised structure of your ship may become positioned between the satellite and the dish. Blockage may also be caused a anything standing near the radome, tall mountains, buildings, bridges, cranes or other larger ships near your ship. Moving or rotating the ship to position the antenna where it has an unobstructed view to the desired satellite will restore the antennas' ability to receive the satellite signal.

3.1.3. Rain Fade

Atmospheric conditions that may cause sufficient loss of signal level include rain, snow, heavy fog and some solar activities (sun spot and flare activity). The most common of these is referred to as "rain fade". Rain drops in the atmosphere reduce the signal from the satellite. The heavier the rain the higher the amount of signal loss. When the amount of loss is high enough, the antenna will not be able to stay locked onto the satellite signal. When the amount of rain has decreased sufficiently, the antenna will re-acquire the satellite signal. In a strong signal area, rain fall of about four inches per hour will cause complete loss of signal. In weaker signal areas the effects would be more pronounced.

3.1.4. Signal level

The level of the receive signal is dependant upon how powerful the transmission is, how wide the signal beam is, and what the coverage area is. Focusing the signal into a narrower beam concentrates its energy over a smaller geographic area, thereby increasing the signal level throughout that area of coverage. This makes it possible for you to use a smaller antenna size to receive that satellite signal. The antenna system must be geographically located in an area where the signal level from the satellite meets (or exceeds) the minimum satellite signal level required for your size of antenna (refer to the Specifications section of this manual) to provide suitable reception. This limits the number of satellites that can be used and the geographic areas where the ship can travel where the signal level is expected to be strong enough to continue providing uninterrupted reception. When traveling outside this minimum signal coverage area, it is normal for the system to experience an interruption in its ability to provide the desired satellite services until entering (or re-entering) an area of adequate signal level.

3.1.5. Satellite Footprints

The focused beam(s) from the satellites are normally aimed at the major land masses where there are large population centers. Footprint charts graphically display the signal level expected to be received in different geographic locations within the area of coverage. The signal will always be strongest in the center of the coverage area and weaker out toward the outer edges of the pattern. The coverage areas are intended to be a guide to reception, however, the actual coverage area and signal level and vary. Also the signal strength is affected by weather.

3.1.6. Linear Satellite polarization

Satellites may transmit their signals in one of two different polarization modes. The feed installed on your antenna must be designed to operate with linear polarized satellite transmissions.

Circular polarized satellite transmissions do not require polarization adjustment to optimize the reception.

Linear polarized satellite transmissions require periodic adjustment of "polarization" to optimize the alignment of the LNB to the angle of the signal from the satellite.

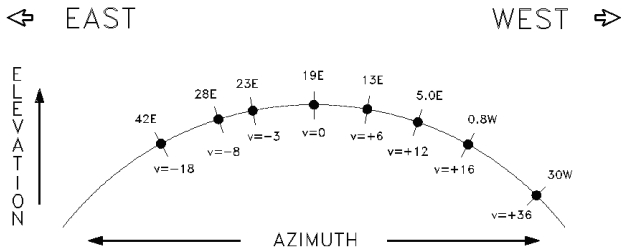

Figure 3-1 Satellite Signal Polarization

When you are at the same longitude as the satellite, its' horizontal and vertical signals will be aligned to your local horizon. When you are east or west of the satellite, the signals will appear to be rotated clockwise or counter-clockwise from your local horizontal and vertical. Both horizontal and vertical signals from a satellite will appear to be rotated the same amount and are always perpendicular to each other. The amount of rotation is dependent on how far east or west you are form the satellite and how close you are to the Equator.

3.2. Antenna Basics

The following information is provided to explain some of the basic functions of the antenna:

3.2.1. Unlimited Azimuth

Azimuth rotation of the antenna is unlimited (no mechanical stops). Azimuth drive, provided by the azimuth motor, is required during stabilization, searching and tracking operations of the antenna. When the ship turns, azimuth is driven in the opposite direction to remain pointed at the satellite. The actual azimuth pointing angle to the satellite is determined by your latitude & longitude and the longitude of the satellite. It is important to know that the antenna should be pointed (generally) toward the equator.

The azimuth angle to the satellite would be 180 degrees true (relative to true north) if the satellite is on the same longitude that you are on. If the satellite is east, or west, of your longitude the azimuth will be less than, or greater than 180 degrees respectively.

When checking for blockage you can visually look over the antenna radome toward the equator to see if any objects are in that sighted area. If you are not able to find any satellites it may also be useful to remove the radome hatch to visually see if the dish is aimed the correct direction (towards the equator).

3.2.2. Elevation

In normal operation the elevation of the antenna will be between 00.0 (horizon) and 90.0 (zenith). The antenna can physically be rotated in elevation below horizon and beyond zenith to allow for ship motion. Elevation drive, provided by the elevation motor, is required during stabilization, searching and tracking operations of the antenna. The actual elevation pointing angle to the satellite is determined by your latitude & longitude and the longitude of the satellite. In general terms the elevation angle will be low when you are at a high latitudes and will increase as you get closer to the equator.

Additionally, from any given latitude, the elevation will be highest when the satellite is at the same longitude that you are on. If the satellite is east, or west, of your longitude the elevation angle will be lower.

3.2.3. Antenna polarization

If you have a circular polarization feed installed, you do not need to adjust the "polarization" of the antenna.

If you have a linear polarization feed installed, the system should have been adjusted properly and set-up to operate in Auto-Polarization mode. The ACU will then automatically adjust the polarization of the feed as the ship changes geographic locations.

3.2.4. Stabilization

Your antenna is stabilized in all three axes of motion. Stabilization is the process of de-coupling the ships' motion from the antenna. Simply put, this allows the antenna to remain pointed at a point in space while the boat turns, rolls or pitches under it. To accomplish this, the Pedestal Control Unit (PCU) on the antenna pedestal assembly senses the motion and applies drive to the appropriate motor(s) in opposition to the sensed motion. Azimuth (AZ), Elevation (EL) and Cross-Level (left-right tilt) are actively stabilized automatically by the PCU as part of its normal operation.

3.2.5. Search Pattern

Whenever the desired satellite signal is lost (such as when the antenna is blocked) the Antenna Control Unit will automatically initiated a Search to re-acquire the desired signal.

Search is conducted in a two-axis pattern consisting of alternate movements in azimuth and elevation. The size and direction of the movements are increased and reversed every other time resulting in an expanding square pattern.

When the antenna is able to re-acquire the desired signal the ACU will automatically stop searching and begin Tracking the signal to optimize the pointing of the antenna to get the highest signal level from the satellite.

3.2.6. Tracking Receiver – Single Channel Per Carrier Receiver

The SCPC Narrow Band Receiver located in the Antenna Control Unit (ACU) is used to acquire, identify and track a narrow band carrier, or beacon signal, or the desired satellite. When properly setup, the settings for the satellite are saved to expedite future acquisition of the desired satellite. The system must have adequate satellite signal level to stop searching (and begin tracking the acquired satellite).

3.2.7. Tracking

Your Antenna Control Unit actively optimizes the pointing of the dish for maximum signal reception. This process is called **tracking** and is accomplished by continuously making small movements of the dish while monitoring the level of the received signal. Evaluation of this information is used to continuously move the stabilization point toward peak satellite signal reception. These minor pointing corrections keep the signal level "peaked" as part of normal operation.

3.3. Components of the System Configuration

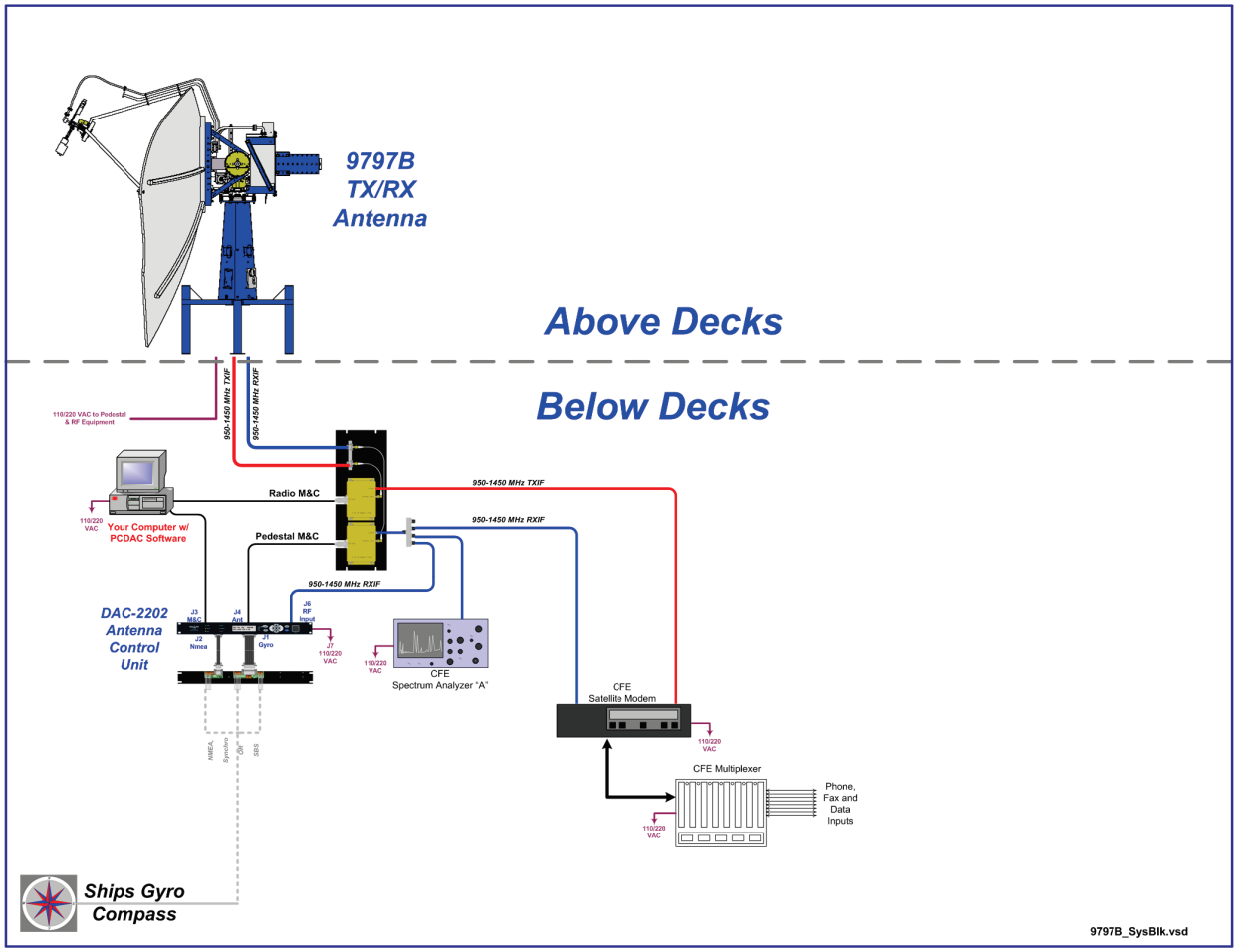

Figure 3-2 9797B TXRX Simplified Block Diagram

The following text provides a basic functional overview of the system components and component interconnection as referred to in the simplified block diagram for your 9797Btenna. Also, refer to the appropriate page of the System Block Diagram which depicts your system configuration.

3.3.1. Antenna ADE Assembly

The Above Decks Equipment consists of an Antenna Pedestal inside a Radome assembly. The pedestal consists of a satellite antenna dish & feed with a linear, or a circular Low Noise Block converter (LNB) with polarization motor mounted on a stabilized antenna pedestal. The radome provides an environmental enclosure for the antenna pedestal assembly inside it. This keeps wind, water condensation and salt-water spray off the antenna pedestal assembly. This prevents damage and corrosion that would shorten the expected life span of the equipment.

Two coaxial cables are connected from the antenna radome assembly to the below decks equipment. One of these cables includes the Antenna Control signaling and IF, the other cable carries the other IF signal.

These cables ultimately provide the input/output signals into/out of the satellite modem.

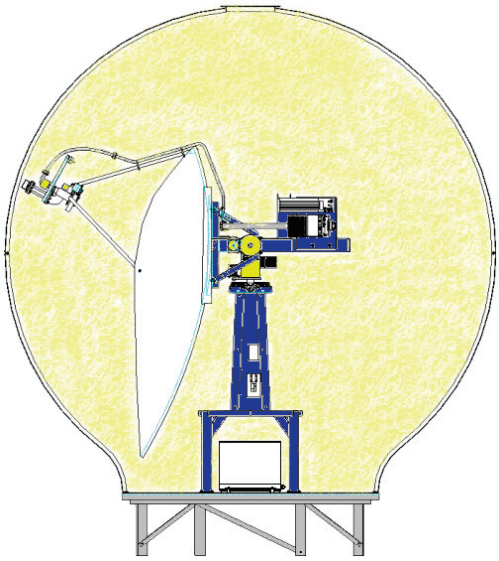

Figure 3-3 Series 97 TXRX Above Decks Equipment

3.3.2. Antenna Control Unit

The Antenna Control Unit allows the operator to control and monitor the antenna pedestal with dedicated function buttons, LED's and a 2 line display. The ACU and its Terminal Mounting Strip are normally mounted in a standard 19" equipment rack. The ACU should be mounted in the front of the equipment rack where it is easily accessible. The Terminal Mounting Strip is normally mounted on the rear of the equipment rack. It is recommended that the antenna control unit be mounted near the Satellite modem location where you can see the LED indicators while you are controlling the antenna.

The Antenna Control Unit is connected to the antenna, ships Gyro Compass and Satellite modem.

Figure 3-4 Antenna Control Unit

The Antenna Control Unit (ACU) communicates via an RS-422 full duplex data link with the Pedestal Control Unit (PCU) located on the antenna. This control signal to/from the antenna is on the Coax cable along with the L-Band Receive IF from the LNB. The Pedestal Control Unit stabilizes the antenna against the ship's roll, pitch, and turning motions. The ACU is the operator interface to the PCU and provides the user with a choice of positioning commands to point the antenna, search commands to find the satellite signal and tracking functions to maintain optimum pointing. The operator may choose to work from either the front panel, using the M&C Port in conjunction with DacRemP remote diagnostic software, or the built in Ethernet port and a internal HTML page using a standard internet browser .

3.3.3. Above Decks AC Power Supply

Pedestal Power - An appropriate source of AC Voltage (110 VAC 60 Hz OR 220 VAC 50 Hz) is required for the above decks equipment. Total power consumption will depend on the number of equipments connected to this power source.

RF Equipment (TX/RX Systems ONLY) - The AC voltage source should be well regulated and surge protected. Uninterrupted Power Supplies are frequently installed (below decks) to provide power for the antenna pedestal, especially if RF Equipment is installed on the pedestal. Refer to the Specifications section of this manual for the power consumption of the antenna pedestal and RF Equipment.

Marine Air Conditioner Unit (TX/RX Systems ONLY) - If a marine air conditioner is included with your system, the AC voltage source should be from a separate AC Power breaker source than the antenna pedestal. AC

power for the air conditioner should be well regulated and surge protected, but does NOT need to from an Uninterrupted Power Supply. Refer to the marine air conditioner manual for its' power requirements and consumption specifications.

3.4. Positive Satellite ID

The ACU has the means of positively identifying a satellite either internally (DVB compliant transponders) or Externally (Modem lock indication via Ethernet, OpenAMIP, or via an analog DC input into the TMS.

For internal satellite ID, all of the DVB receiver parameter settings must be set to match that of the inbound transponder.

For external satellite ID, the NID value must be set to 0000 and the system type parameter must include the 2 value at minimum.

- For OpenAMIP compatible satellite modems, an Ethernet cable connection to the ACU's Ethernet port is required. NOTE: The modems option file must be built to enable the appropriate Rx lock indication.
- For non-OpenAMIP compatible satellite modems, 2 wires coming from the Satellite modems must be connected to the AGC and Ground input pins of the TMS.

3.5. Open Antenna-Modem Interface Protocol (OpenAMIP™) Specification:

3.5.1. Overview:

OpenAMIP, an ASCII message based protocol invented and Trademarked by iDirect is a specification for the interchange of information between an antenna controller and a satellite modem. This protocol allows the satellite modem to command the ACU (via TCP port 2002) to seek a particular satellite as well as allowing exchange of information necessary to permit the modem to initiate and maintain communication via the antenna and the satellite. In general, OpenAMIP is not intended for any purpose except to permit a modem and the ACU to perform synchronized automatic beam switching. It is ***NOT*** a status logging system or a diagnostic system. In addition, OpenAMIP is intend for a typical installation whereby a specific satellite modem and Antenna system are properly configured to work together. The protocol does not make specific provisions for auto-discovery or parameter negotiation. It is still the responsibility of the installer to assure the parameters of both the satellite modem (proper option files) and the ACU/PCU (setup parameters) are actually compatible for the intended satellite(s).

3.5.2. Interface requirements:

3.5.2.1. Hardware

Sea Tel Antenna Control Units Model DAC2202 or DAC2302.

Any Satellite modem manufacturer that is compatible with OpenAMIP

CAT5 Patch cable

3.5.2.2. Software

Sea Tel model DAC2202:

ACU software version 6.06 or greater

CommIF module software version 1.11 or greater

Sea Tel model DAC2302:

ACU software version 7.06b or greater

CommIF module software version 1.11 or greater

3.5.3. Utilized OpenAMIP Commands:

3.5.3.1. Antenna Commands:

Command	Description	Example
S f1 f2 f3	Satellite Longitude, 3 parameters: Degrees E/W (-value equals West), Latitude Variance (Inclined Orbit), Sat Skew Offset	"S -20.1 1.0 3.5"
P c1 c2	Polarization, 2 parameters:	"P L R"

	H,V,L,, or R	
H f1 f2	Tracking Frequency: 2 Parameters: Center Frequency and Bandwidth in MHz	"H 14123.321 0.256"
B f1 f2	Down Conversion Offset: 2 parameters: LNB (Receive) Local Oscillator and BUC (TX) L.O.	"B 10750"
F	Find, Target satellite using existing S, P,R, and H Parameters	
A i	Set keep alive in seconds (0 = off)	"A 5"
L b1 b2	Modem Lock and free to transmit. 2 parameters: b1 indicates Rx lock and b2 (not utilized) enables/disables Tx Mute to BUC	"L 1 1"
W i	GPS Update: Sets GPS Update period in seconds (0 = Off)	"W 300"
I s1 s2	Set modem vendor (s1) and device (s2) 2 parameters:	"I iDirect 5100"

3.5.3.2. Modem Commands:

Command	Description	Example
a i	Set keep alive in seconds (0 = off)	"a 5"
i s1 s2	Set Antenna Vendor (s1) and device (s2) 2 parameters:	"i Sea Tel DAC-2202"
s b1 b2	Antenna Status: 2 parameters: b1 is functional status and b2 is Tx allowed	"s 1 1"
w b1 f1 f2 t1	Set GPS Position: 4 parameters: b1 is validity flag, f1 is latitude, f2 is longitude, and t1 is timestamp	"w 1 38.222 122.123 0"

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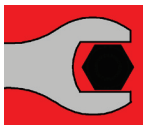
4. Installation

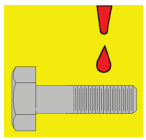
This section contains instructions for unpacking, final assembly and installation of the equipment. It is highly recommended that final assembly and installation of the Antenna system be performed by trained technicians. Read this complete section before starting.

4.1. General Cautions & Warnings



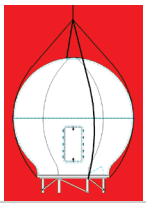
WARNING: *Assure that all nut & bolt assemblies are tightened according the tightening torque values listed below:*

Bolt Size	Inch Pounds
1/4-20	75
5/l6-18	132
3/8-16	236
1/2-13	517

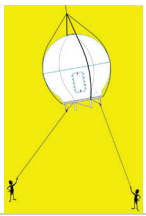


NOTE: *All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
222	Low strength for small fasteners.
243	Medium strength, oil tolerant.
680	High strength for Motor Shafts & Sprockets.
271	Permanent strength for up to 1" diameter fasteners.
290	Wicking, High strength for fasteners which are already assembled.



WARNING: *Hoisting with other than a webbed four-part sling may result in catastrophic crushing of the radome. Refer to the specifications and drawings for the fully assembled weight of your model Antenna/Radome and assure that equipment used to lift/hoist this system is rated accordingly.*



CAUTION: *The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while the antenna assembly is being hoisted to its assigned location aboard ship.*

WARNING: *Electrical Hazard – Dangerous AC Voltages exist inside the Antenna Pedestal Breaker Box. Observe proper safety precautions when working inside the Pedestal Breaker Box.*

WARNING: *Electrical Hazard – Dangerous AC Voltages exists on the side of the Antenna Pedestal Power Supply. Observe proper safety precautions when working inside the Pedestal Power Supply.*

	WARNING: *RF Radiation Hazard - This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**
	WARNING: *RF Radiation Hazard - Prior to working on the stabilized antenna system, the power to the* ***transmit/receive*** *equipment must be locked out and tagged.* ***Turning OFF power to the Antenna Control Unit does NOT turn Transmit power output OFF.*** **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**
	WARNING: *RF Radiation Hazard - When the transmit/receive system is in operation, no one should be allowed anywhere within the radiated beam being emitted from the reflector.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**

4.2. Site Survey

The radome assembly should be installed at a location aboard ship where:

1. The antenna has a clear line-of-sight to as much of the sky (horizon to zenith at all bearings) as is practical.
2. Direct radiation into the antenna from ships radar, especially high power surveillance radar arrays, is minimized. The radome should be as far away from the ships Radar as possible and should NOT be mounted on the same plane as the ships Radar (so that it is not directly in the Radar beam path).
3. The radome should be as far away from the ships high power short wave (MF & HF) transmitting antennas as possible.
4. The Above Decks Equipment (ADE) and the Below Decks Equipment (BDE) should be positioned as close to one another as possible. This is necessary to reduce the losses associated with long cable runs.
5. The mounting location is rigid enough that it will not flex, or sway, in ships motion or vibration. If the radome is to be mounted on a raised pedestal, it ***MUST*** have adequate gussets, or be well guyed, to prevent flexing or swaying in ships motion.

If these conditions cannot be entirely satisfied, the site selection will inevitably be a "best" compromise between the various considerations.

4.3. Preparing For The Installation

4.3.1. Unpack Shipping Crates

Exercise caution when unpacking the equipment.

4.3.2. Inspect / Inventory

Carefully inspect the radome panel surfaces for evidence of shipping damage. Inspect the pedestal assembly and reflector for signs of shipping damage.

4.3.3. Prepare ADE Mounting Location

Prepare the mounting location for the Radome. If the radome is to be bolted to the deck (or a platform) assure that the mounting holes have been drilled. Assure that the mounting hardware has obtained and is readily available.

4.3.4. Preparing BDE Location

Prepare the mounting location for the Below Decks Equipment. These equipments would normally be installed in a standard 19" equipment rack. Refer to the Antenna Control Unit manual for installation of the ACU and the Terminal Mounting Strip.

Refer to the vendor supplied manuals for installation of the other below decks equipments.

Prepare other locations throughout ship for any other equipment which is not co-located with the ACU.

4.3.5. Installing The System Cables

Install appropriate cables from Below Decks Equipment to the ADE Location(s).

The cables must be routed from the above-decks equipment group through the deck and through various ship spaces to the vicinity of the below-decks equipment group. When pulling the cables in place, avoid the use of excessive force. Exercise caution during the cable installation to assure that the cables are not severely bent (proper bend radius), kinked or twisted and that connectors are not damaged.

Assure that the cables have been run through watertight fittings and/or will not permit water entry into the ship when the installation is completed. After cables have been routed and adjusted for correct cable length at each end, seal the deck penetration glands and tie the cables securely in place.

4.4. Assembling the ADE

4.4.1. Preparing for Assembly of the ADE

Read this entire assembly procedure ***before*** beginning.

Refer to the System Block diagram, General Assembly, Baseframe Assembly, Radome Assembly and Radome Installation Arrangement drawings for your system.

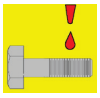
Select a secure assembly site that provides enough area to work with the large radome panels while sub-assembling the baseframe, sections of the radome, Antenna Pedestal and Reflector & Feed. The area should be a clean, flat location, free of rocks & debris (ie concrete). The site should also provide protection from wind, rain and other adverse weather. A hoist, or small crane, is needed to assemble these sub-assemblies to form the final ADE Assembly.

As an example, you might sub-assemble everything on the pier where the ship will tie up, then use the crane to put the sub-assemblies together and lift the whole ADE up to the mounting location on the ship.

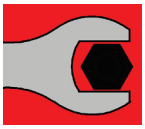
You can change order of these steps, however, in the end the objective is to have a well sealed radome with flanges that are clean of excess caulking. In addition it is important that the ADE is structurally sound for severe weather conditions.

4.4.2. 144" Radome, Baseframe and Antenna Pedestal System Assembly

Refer to the System Block diagram, General Assembly, Radome Assembly and Baseframe Assembly drawings for your system.



NOTE: **Unless otherwise indicated, all nuts and bolts should be assembled with Loctite 271 or its equivalent.**



WARNING: *Assure that all nut & bolt assemblies are tightened according the tightening torque values listed below:*

SAE Bolt Size	Inch Pounds	Metric Bolt Size	Kg-cm
1/4-20	75	M6	75.3
5/l6-18	132	M6	225
3/8-16	236	M12	622
1/2-13	517		

1. Select a secure assembly site that provides enough area to work with the large radome panels. Place the radome base pan on temporary support blocks at least 22 inches high.
2. Assemble the radome base frames eight legs and eight braces using the hardware provided. Loosely assemble all legs and braces aligning all matching marks before tightening any of the bolts. Insure that a split washer is used under each nut.

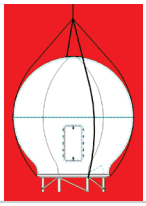
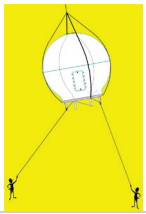
3. Refer to the radome assembly drawing. Observe the painted numbers on the radome panels that clearly identify their positions respective to each other and the base pan assembly.
4. Loosely assemble the 6 lower side panels, using the hardware provided, to form the bottom half of the radome. Do NOT tighten the bolts at this time. Open each seam wide enough to install a good bead of silicone caulk, then firmly tighten all the bolts in that flange. Repeat until all flanges are sealed.
5. Loosely assemble the 6 upper side panels, using the hardware provided, to form the upper half of the radome. Do NOT tighten the bolts at this time. Open each seam wide enough to install a good bead of silicone caulk, then firmly tighten all the bolts in that flange. Repeat until all flanges are sealed.
6. Apply a good bead of silicone caulk all the way around the top cap. Install the cap into the upper radome panel assembly using the hardware provided and tighten all the bolts.
7. Set the lower half of the radome assembly on the base pan aligning the painted numbers on the radome panels. Loosely attach the lower side panel assembly to the base frame using the hardware provided. Do NOT tighten the bolts at this time. Lift the lower side panel assembly wide enough to install a good bead of silicone caulk between it and the base pan, then firmly tighten all the bolts.
8. Fasten the antenna pedestal assembly, complete with base stand, to the base pan using the 1/2-13 x 1 1/2 (or the 3/8-16 x 1 1/2) inch bolts inserted from the bottom up and install a flat washer, a lock washer and a nut in each mounting hole. Apply Loctite 271 and tighten securely.
9. Attach the antenna assembly (reflector, struts and feed) to the stabilized pedestal, by using the reflector mounting hardware provided. Position the antenna over the four antenna support struts (the antenna and the dish mounting clips are numbered or color coded make sure they match). Insert the four mounting bolts, washers and nuts, apply Loctite 271 and tighten.
10. Attach the 15 pin connector on the antenna reflector harness to the shielded Polang Aux Relay box. Connect the IF receive coax cables from the feed to the pedestal Modem or coax relay/switch panel according to the block diagram.
11. Using a four point web lifting sling and lifting clips, lift the upper half of the radome up over the antenna pedestal and set it onto the lower side panels aligning the painted numbers on the radome panels. Loosely attach the upper and lower halves of the radome using the hardware provided. Do NOT tighten the bolts at this time. Insert wedges between the upper side panel assembly and the lower side panel assembly to hold open a space wide enough to install a good bead of silicone caulk between it and the lower side panels, then remove the wedges and firmly tighten all the bolts.
12. Gently restrain the antenna prior to lifting the ADE onto the ship to restrict movement inside the radome during the lift.

4.4.3. Preparing the ADE for Lift

Install Stow Braces, or other restraints, on the Antenna Pedestal. Attach shackles and web type lifting harness to the four lifting holes in the base-frame.

4.5. Installing The ADE

4.5.1. Hoist

	***WARNING**: Hoisting with other than a webbed four-part sling may result in catastrophic crushing of the radome. Refer to the specifications and drawings for the fully assembled weight of your model Antenna/Radome and assure that equipment used to lift/hoist this system is rated accordingly.*
	***CAUTION**: The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while the antenna assembly is being hoisted to its assigned location aboard ship.*

1. Assure that the antenna is restrained before hoisting. Check that all nuts on the base frame assembly are tightened according the torque values listed below:
2. Using a four-part lifting sling, and with a tag line attached to the radome base frame, hoist the antenna assembly to its assigned location aboard ship by means of a suitably-sized crane or derrick.
3. The radome assembly should be positioned with the BOW marker aligned as close as possible to the ship centerline. Any variation from actual alignment can be compensated with the AZIMUTH TRIM adjustment in the ACU, so precise alignment is not required.

4.5.2. Install Antenna/Radome/Baseframe

Bolt, or weld, the legs of the radome base frame directly to the ship's deck. If the deck is uneven or not level, weld clips to the deck and attach them to the legs of the radome base frame. When completed the radome base must be level.

4.5.3. Cooling Unit Assembly - TX SYSTEMS ONLY

If cooling unit is supplied, refer to the drawings provided for detailed instructions on assembly and installation of the cooling unit and any associated intake and exhaust diffusion ducting.

4.6. Install BDE Equipment

4.6.1. ACU & TMS

Refer to the Antenna Control Unit manual for installation of the ACU and the Terminal Mounting Strip.

4.6.2. Other BDE Equipment

Refer to the vendor supplied manuals for installation of the other below decks equipment.

4.7. Cable Terminations

4.7.1. At The Radome

The TX and RX, or TVRO IF, cables must be inserted through the cable strain reliefs at the base of the radome. Apply RTV to the strain relief joints and tighten the compression fittings to make them watertight. Attach the pedestal cable adapters to the TX and RX, or TVRO IF, cables from below decks. Refer to the System Block Diagram.

AC Power cable for the Antenna Pedestal and RF Equipment is routed into the AC Power Breaker box and connected to the breaker terminals.

Sea Tel recommends that separate, dedicated, AC Power be provided for the Marine Air Conditioner (Do NOT combine with the AC Power provided for the Antenna Pedestal and RF Equipment). This AC Power cable is routed into the Marine Air Conditioner and terminated to the AC terminals inside.

4.7.2. ACU & TMS

To Connect AC Power, Gyro Compass Connection and IF Input refer to the Antenna Control Unit manual. Installation of optional (remote) Pedestal, and /or Radio, Monitor & Control connection(s) from a PC Computer are also contained in the ACU manual.

4.7.3. Other BDE Equipment

Refer to the vendor supplied manuals for installation of the other below decks equipment.

4.8. Final Assembly

4.8.1. Mount RF Equipment (TXRX Only)

Install the RF equipment on the elevation beams (TXRX Systems ONLY) Connect the TXIF & RXIF cables, RF Transmit and Receive waveguide sections from the appropriate C-Band feed to the appropriate SSPA or TWTA and Radio package according to the block diagram.

4.8.2. Remove Stow Braces/Restraints

Remove the restraints from the antenna and verify that the antenna moves freely in azimuth, elevation, and cross level without hitting any flanges on the radome.

4.8.3. Verify all assembly and Wiring connections

Verify that all pedestal wiring and cabling is properly dressed and clamped in place.

4.8.4. Balance Antenna Pedestal

Assure that the antenna assembly is balanced front to back, top to bottom and side to side by observing that it remains stationary when positioned in any orientation. Refer to the Maintenance section for complete information on balancing the antenna.

4.9. Power-Up The ADE

Turn Pedestal AC power breaker ON.

4.9.1. Initialization

Turn the pedestal power supply ON. The PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps to initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions. Each phase must complete properly for the antenna to operate properly (post-initialization). Refer to the initialization text in the Troubleshooting section in this manual. Observe the Initialization of the antenna pedestal.

If any of these steps fail, or the ACU reports model "xx97", re-configure the PCU as described in the Setup section of this manual. If initialization still fails, this indicates a drive or sensor problem, refer to the Troubleshooting section.

4.9.2. Home Flag Position

Note the approximate position of the antenna relative to the bow of the ship while it is at the home switch position. This information will be used later to calibrate the relative position display of the antenna.

4.9.3. BDE

Turn Power ON to the ACU. Record the power-up display, Master (ACU) Model & Software version and the Remote (PCU) Model & Software version.

4.10. Setup

Refer to the Setup information in the next section of this manual and in the Setup section of your ACU Manual.

5. Setup

Below are basic steps to guide you in setting up the ACU for your specific antenna pedestal. Assure that the Antenna Pedestal (ADE) has been properly installed before proceeding. Refer to the Setup section of you ACU manual for additional parameter setting details.

5.1. Operator Settings

Refer to the Operation chapter of this manual to set the Ship information. Latitude and Longitude should automatically update when the GPS engine mounted above decks triangulates an accurate location, but you may enter this information manually to begin. If your gyro source is providing Heading information in any format other than NMEA-0183 format, you will have to enter in the initial Ship's Heading position, the Gyro Compass will then keep the ACU updated.

Set the Satellite information, for the satellite you will be using. The receiver settings are especially important. At this point you should be able to target the desired satellite. Continue with the setup steps below to optimize the parameters for your installation.

5.2. AUTO TRIM

The Auto Trim function will automatically calculate and set the required Azimuth and Elevation trim offset parameters required to properly calibrate the antennas display to the mechanical angle of the antenna itself.

Refer to "Optimizing Targeting" in the Setup section of this manual for further details on the parameters set.

To enable this function, the Antenna MUST be actively tracking the satellite with positive SAT ID: After locating the satellite wait at least 30 seconds before performing the AUTO TRIM feature, this will allow sufficient time for the antenna to peak up on signal. It is equally important that you verify that the system is tracking the CORRECT satellite (verify video is produced on the Televisions in a TVRO system or verify a RX lock indication on the satellite modem in a VSAT system).

While in the AUTO TRIM sub-menu, press the LEFT arrow key to bring start the calibration procedure, the display should read AUTO TRIM SETUP, press the ENTER key to submit. AUTO TRIM SAVED will be displayed, indicating the proper AZ and EL trims were submitted to RAM. This does not save these parameters to NVRAM, in order to save to memory, continue down through the setup mode parameters until the SETUP **SAVE NEW PARAMETERS** sub menu is displayed. Press the RIGHT arrow and then press the ENTER key. The display should now report that the parameters were saved.

NOTE: The AUTO TRIM feature only will work if your system is actively tracking a satellite (AGC above threshold ***and*** positive SAT ID, internal NID match or external RX lock received, has been established). If any of the previous conditions are not met, AUTO TRIM LOCKED will be displayed on the front panel, indicating that the AUTO TRIM Feature is not enabled. From the AUTO TRIM SETUP screen, press any MODE key (DAC2302) or NEXT key (DAC2202) without hitting ENTER to escape this screen without submitting the new AZ and EL Trim values.

5.3. Optimizing Targeting (Auto Trim)

The following feature requires your antenna have GSR2 minimum software versions installed. First, assure that all of your Ship & Satellite settings in the ACU are correct. Target and, if required manually locate the desired satellite. Allow 1 to 2 minutes for the antenna to "peak" on the signal. Verify positive satellite identification, in a TVRO system verify either Receive NID or that at least one Television is producing video, in a VSAT system verify receive lock indication on the satellite modem.

Access the ACU Setup Mode Parameter "AUTO TRIM", Press the UP arrow and then press Enter.

Drive the antenna completely off satellite (Target and Azimuth value of 0)

Retarget the satellite and verify the system peaks on satellite with positive satellite identification within 1 minute.

Access the ACU Setup Modes "SAVE NEW PARAMETERS", Press the UP arrow and then press Enter

5.4. Optimizing Targeting (Manually)

First, assure that all of your Ship & Satellite settings in the ACU are correct. Target the desired satellite, immediately turn Tracking OFF, and record the Azimuth and Elevation positions in the "***ANTENNA***" display of the ACU (these are the **Calculated** positions). Turn Tracking ON, allow the antenna to "Search" for the targeted satellite and assure that it has acquired (and peaks up on) the satellite that you targeted. Allow several minutes for the antenna to "peak" on the

signal, and then record the Azimuth and Elevation positions while peaked on satellite (these are the **Peak** positions). Again, assure that it has acquired the satellite that you targeted!

Subtract the Peak Positions from the Calculated Positions to determine the amount of Trim which is required. Refer to the ACU Setup information to key in the required value of Elevation Trim. Continue with Azimuth trim, then re-target the satellite several times to verify that targeting is now driving the antenna to a position that is within +/- 1.0 degrees of where the satellite signal is located.

EXAMPLE: The ACU targets to an Elevation position of 30.0 degrees and an Azimuth position of 180.2 (Calculated), you find that Peak Elevation while ON your desired satellite is 31.5 degrees and Peak Azimuth is 178.0. You would enter an EL TRIM value of –1.5 degrees and an AZ TRIM of +2.2 degrees. After these trims values had been set, your peak ***on satellite*** Azimuth and Elevation displays would be very near 180.2 and 30.0 respectively.

5.1. Sat Skew setting

The Satellite Skew setting in the Satellite – Tracking Receiver sub-menu (prior to NID) is used to enter the skew of the satellite to optimize polarity angle.

This feature is used in conjunction with POL OFFSET to optimize polarization of the feed. POL OFFSET will serve to calibrate the feed itself (mechanical calibration) Before adjusting the SKEW parameter, target a satellite that is of your same longitudinal position (ie from Concord, CA at 38N and 122W we would target a satellite value of 122W). Drive the reflector to 0 or 5 degrees elevation (this is so you can easily view the feed). And verify that the feed is a pure vertical. This may be visually verified by placing a level bubble on the LNB itself. During Cross-Pol isolation tests, enter in the known skew value of the satellite, then as instructed by the NOC to drive the feed assembly, increase or decrease the SAT SKEW parameter. Each digit represented on this screen represents one whole degree of feed drive.

5.2. Polarity Angle (POLANG) Parameters

First of all make sure that the polang parameters are set correctly:

1. POL TYPE – should be set to 0072 (Auto-Pol mode).
2. POL OFFSET – This is initially set to factory default (0040) but will be incremented, or decremented, to calibrate the feed to the horizon with a level (bubble or digital).
3. POL SCALE – Leave this at the factory default setting of 0090.
4. Go to the TX POLARITY parameter in the Setup menu of the ACU and set this parameter to your assigned Transmit polarity (2=Horizontal or 4=Vertical).
5. Target your desired satellite (as provided by you airtime provider).
6. Verify the system has acquired the correct satellite, else continue searching until the correct satellite is acquired, and set your satellite modem (or spectrum analyzer) to view its signal level display.
7. Allow tracking to peak the satellite signal.
8. SAT SKEW – This setting will be incremented, or decremented, to optimize the polarity to peak the received satellite signal, and later to do cross-pol isolation with the airtime provider, network operation center or satellite provider.
9.

5.3. Optimizing Auto-Polarization Cross-Pol Isolation

During commissioning, under guidance from the network operation center, you will be adjusting to minimize the effect of your transmission on the opposite polarization which maximizes your Cross-Pol isolation. Contact your satellite provider to help you (over the phone) to optimize the polarity angle for maximum Cross-Pol isolation (this optimizes your transmit polarity and is much more accurate than trying to optimize your receive polarity).

1. Verify that tracking is ON and that the antenna is peaked on your targeted satellite (targeting calculates the azimuth, elevation and polarization angles).
2. Follow your service provider technicians instructions to set the modem to begin transmitting a CW (pure carrier) signal.
3. Go to the SAT SKEW parameter in the Satellite menu of the ACU.
4. Press the LEFT arrow to edit the current value.
5. While under direction of the technician (on the phone), press the UP arrow to increment or the DOWN arrow to decrement the value and then hit the ENTER key to adjust the feed.

6. The technician should indicate whether the adjustment you made improved, or worsened, the cross-pol isolation. If it improved he will have you make another small adjustment in the same direction. If it worsened he will have you make a small adjustment in the opposite direction.
7. Press the RIGHT key again, make the next change as directed and hit ENTER to carry out the adjustment.
8. Repeat this process of making small adjustments until the technician confirms that cross-pol isolation is optimized.
9. **Save** your new SAT SKEW value.

5.4. Calibrating Relative Antenna Position (Home Flag Offset)

During initialization, azimuth drives the CW antenna until the Home Switch is contacted, which "presets" the relative position counter to the value stored in the Home Flag Offset. This assures that the encoder input increments/decrements from this initialization value so that the encoder does not have to be precision aligned.

The Home Switch is a micro switch with a roller arm which is actuated by cam mounted on the azimuth driven sprocket, or it is a hall sensor which is actuated by a magnet mounted on the azimuth driven sprocket, which produces the "Home Flag" signal.

The Home Flag Offset is a value saved in NVRam (Non-Volatile RAM) in the PCU. This value is the relative position of the antenna when the home switch is engaged. Presetting the counter to this value assures that when the antenna is pointed in-line with the bow of the ship the counter will read 000.0 **Relative** (360.0 = 000.0).

In most cases when the antenna stops at the home flag, it will be pointed in-line with the Bow of the ship. In these cases Home Flag Offset (HFO) should be set to zero. When "Optimizing Targeting" small variations (up to +/- 5.0 degrees) in Azimuth can be corrected using If it AZ TRIM as described in the Optimizing Targeting procedure above.

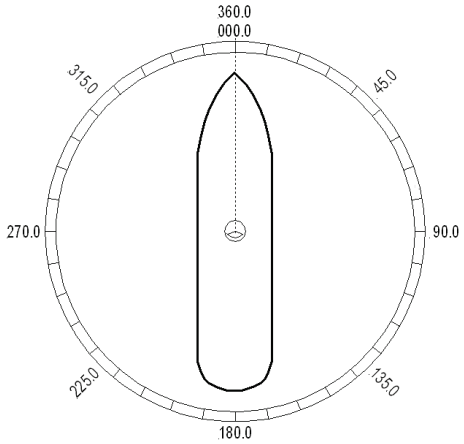


Figure 5-1 Antenna stops In-line with Bow

Large variations in Azimuth position indicate that the Relative position is incorrect and should be "calibrated" using the correct HFO value instead of an Azimuth Trim offset. This is especially true if sector blockage mapping is used.

If the antenna stops at the home flag, but it is NOT pointed in-line with the Bow of the ship, it is important to assure that the antennas ***actual*** position (relative to the bow of the ship) is the value that gets "preset" into the Relative position counter. By saving the antennas ***actual*** Relative position when at the home flag into HFO, you have calibrated the antenna to the ship.

5.4.1. <u>To Calculate HFO</u>:

If Targeting has been optimized by entering a large value of AZ TRIM; First, verify that you are able to repeatably accurately target a desired satellite (within +/- 1.0 degrees). Then you can use the AZ TRIM value to calculate the value of HFO you should use (so you can set AZ TRIM to zero). AZ Trim is entered as the number of ***tenths*** of degrees. You will have to convert the AZ TRIM value to the nearest **whole** degree (round up or down as needed). Calculated HFO value is also rounded to the nearest whole number.

If AZ TRIM was a **plus** value: HFO = (TRIM / 360) x 255 Example: AZ TRIM was 0200 (plus 20 degrees). HFO = (20/360) x 255 = (0.0556) x 255 = 14.16 round off to 14.

If AZ TRIM was a **negative** value: HFO = ((360-TRIM) / 360)) x 255 Example: AZ TRIM = -0450 (minus 45 degrees). HFO = ((360 – 45) / 360)) x 255 = (315 / 360) x 255 = 0.875 x 255 = 223.125 round of to 223.

If Targeting has NOT been optimized, allow the antenna to initialize to its home flag position. Visually compare the antennas pointing to the bow-line of the ship (parallel to the Bow). Note the antennas position relative to the Bow. If it appears to be very close to being parallel to the bow, HFO will probably not be needed and you can proceed with Optimizing Targeting. If it is NOT close, initialization was driving the azimuth CW, note if the antenna appears to have stopped before it got to the Bow or if it went past the Bow. You may be able to guess an approximate amount of how many degrees the antenna is from the bow. This is only intended to help you initially find the satellite (which direction you will have to drive and approximately how far you will have to drive). Refer, in general terms, to the Optimizing Targeting procedure.

If the antenna stopped before it got to the bow-line; When you initially target a satellite, the antenna will also stop prior to the satellite position, so you that will have to drive the Azimuth of the antenna UP to actually find the satellite. Using the same basic procedure as in the Optimizing Targeting paragraph, target the satellite and record the "Calculated" Azimuth position that the antenna was driven to. Drive UP until you find the satellite, positively identify that you are on **the satellite** you targeted and allow tracking to peak the antenna position. Record the "Peak" Azimuth position. Subtract the "Peak" position from the "Calculated" position to determine the number of degrees of AZ TRIM that would be required.

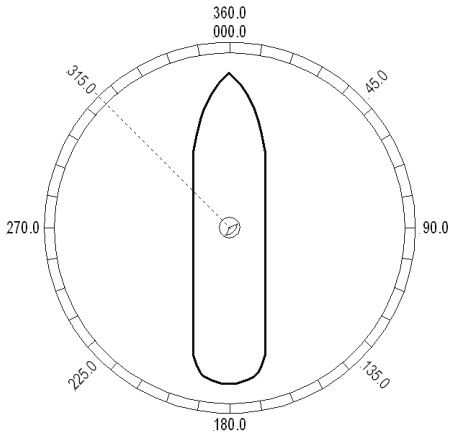


Figure 5-2 Antenna stopped before the Bow

Example: In this new installation, I target my desired satellite and record the Calculated Azimuth to be 180.5. I drive UP and finally find my desired satellite at a Peak Azimuth of 227.0 degrees. I subtract Peak from Calculated and difference to be –46.5 degrees, therefore the actual Relative position that needs to be preset into the counter when the antenna is at the Home Flag is 313.5. HFO = ((360-46.5) / 360)) x 255 = (313.5 / 360) x 255 = 0.87 x 255 = 222.06 which I round down to 222.

If the antenna went past the bow-line; When you initially target a satellite, the antenna will also go past the satellite position, so that you will have to drive the Azimuth of the antenna DOWN to actually find the satellite. Using the same basic procedure as in the Optimizing Targeting paragraph, target the satellite and record the "Calculated" Azimuth position that the antenna was driven to. Drive DOWN until you find the satellite, positively identify that you are on **the satellite** you targeted and allow tracking to peak the antenna position. Record the "Peak" Azimuth position. Subtract the "Peak" position from the "Calculated" position to determine the number of degrees of AZ TRIM that would be required. . Refer to the calculations above to determine the HFO you should use for this antenna.

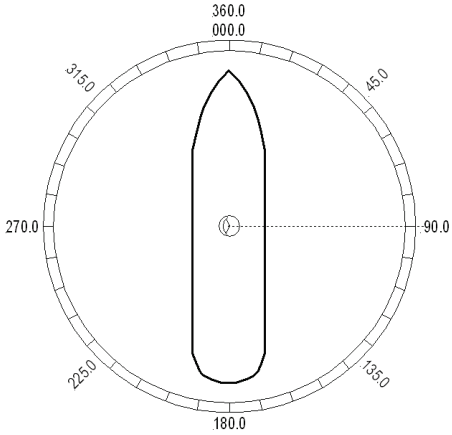


Figure 5-3 Antenna stops past the Bow

Example: In this new installation, I target my desired satellite and record the Calculated Azimuth to be 180.0. I drive DOWN and finally find my desired satellite at a Peak Azimuth of 90.0 degrees. I subtract Peak from Calculated and difference to be +90.0 degrees, therefore the actual Relative position that needs to be preset into the counter when the antenna is at the Home Flag is 90.0. HFO = ((90.0) / 360)) x 255 = 0.25 x 255 = 63.75 which I round up to 64.

5.4.2. <u>To Enter the HFO value</u>:

To enter the calculated HFO value, press & hold both LEFT and RIGHT arrows for six seconds to enter the parameter menu at the EL TRIM parameter window. Press DOWN arrow key numerous times (about 21) until you have selected the REMOTE COMMAND window.

In the REMOTE COMMAND window, press the LEFT arrow key until you have underscored the left most character in the displayed value (ie the A in "A0000"). Use the UP/DOWN arrow keys to increment/decrement the underscored character until it is upper case **N** ("N0000" should appear in the command window). Press the RIGHT arrow key to move the cursor under the most significant digit, then use the UP arrow key to increment it to a value of 6 (the display is now "N6000"). Set the three digits to the right of the 6 to the three digit HFO value from 000 to 255 (corresponding to 0 to 360 degrees) that you calculated above. Use the LEFT/RIGHT keys to underscore the desired digit(s) then use the UP/DOWN arrow keys to

increment/decrement the underscored value. When you have finished editing the display value, press ENTER to send the HFO value command to the PCU (but it is not save yet).

If you want to find out what the ***current*** HFO value is key in N6**999** and hit **ENTER**.

When completed, you must save the desired HFO value. Press ENTER several times to select the REMOTE PARAMETERS display. Press the LEFT or RIGHT arrow key to enter writing mode and then press the ENTER to save the HFO value in the PCUs NVRAM.

EXAMPLE: In the "You Observe "Home" Pointing is LEFT of the Bow-line" example above, the HFO calculated was 222. To enter this value:

1. Set the Remote Command value to "**N6222**".
2. Press **ENTER** to send this HFO to the PCU. The display should now show "N0222".
3. When completed, you must save the desired HFO value. Press **ENTER** several times to select the **REMOTE PARAMETERS** display. Press the **LEFT** or **RIGHT** arrow key to enter writing mode and then press the **ENTER** to save the HFO value in the PCUs NVRAM.

You must drive the antenna CW in azimuth until the home switch is actuated, or re-initialize the antenna ***to begin using the new HFO value*** you have entered and saved. To re-initialize the antenna from the REMOTE COMMAND window of the ACU;

4. Press **UP** arrow key several times to return to the **REMOTE COMMAND** display.
5. Press the **LEFT** or **RIGHT** arrow key to enter edit mode. Use the **LEFT**/**RIGHT** and **UP**/**DOWN** arrow keys to set the character and digits to "^**0090**" and then press the **ENTER** key.

This resets the PCU on the antenna. The antenna will reinitialize with this command (Performs a similar function as a power reset of the antenna) and the new home flag offset value will be used to calibrate the Relative position of the antenna.

5.4.3. Radiation Hazard and Blockage Mapping (AZ LIMIT parameters)

The ACU can be programmed with relative azimuth sectors (zones) where blockage exists or where transmit power would endanger personnel who are frequently in that area. Your ACU software may allow you to set four zones or it may only three zones and include +5 volt polarization.

When the AZ LIMIT parameters are set to create these *ZONES*, up to four, several things happen when the antenna is within one of the zones:

1. Tracking continues as long as the AGC value is greater than the Threshold value. When the AGC value drops below Threshold, the antenna will wait "Search Delay" parameter amount of time and then re-target the satellite you targeted last (if 4 value is included in SYSTEM TYPE). Timeout and re-target will continue until the satellite is re-acquired and tracking can resume.
2. "BLOCKED" will be displayed in the TRACKING window wherever the antenna is inside one of the zones.
3. A contact closure to ground (or an open if the blockage logic is reversed – See SYSTEM TYPE 16 value) is provided on the SW2 terminal of the Terminal Mounting Strip. This Switch output provides a "Blocked", "RF Radiation Hazard" or "FCC TX Mute" logic output. When the antenna exits the zone it will be on satellite, tracking and the SW2 logic contact closure will open.

The lower and upper limits are user programmable and are stored in NVRAM within the ACU parameter list.

AZ LIMIT 1 is the Lower Relative AZ limit (this is the more counter-clockwise of the two points, even if it is numerically larger). AZ LIMIT 2 is the Upper Relative AZ limit (the more clockwise of the two points) for pattern mapping of ZONE 1. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 12 parameter.

AZ LIMIT 3 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 4 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 2. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 34 parameter.

AZ LIMIT 5 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 6 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 3. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 56 parameter.

AZ LIMIT 7 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 8 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 4. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 78 parameter. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

***CAUTION**: The **Lower** Relative AZ limit is the more **counter-clockwise** of the two points (even if it is numerically larger) and the **Upper** Relative AZ limit is the more clockwise of the two points. If you enter the two relative points incorrectly, Tracking and Searching will be adversely affected.*

The ACU provides a contact closure to ground on the SW2 terminal of the Terminal Mounting Strip when the antenna is pointed within any one of the blockage/hazard zones or the system is searching, targeting, unwrapping or is mis-pointed by 0.5 degrees or more (FCC TX Mute function for Transmit/Receive systems ***only***). The contact closure is a transistor switch with a current sinking capability of 0.5 Amp. Pressing the 5 key when the TRACKING window is selected can ***simulate*** a manual BLOCKED condition to test SW2 logic output. UP arrow key is pressed to turn the simulated blocked condition OFF.

When used as simple "**BLOCKED**" logic output for a single Sea Tel antenna, this output could be used to light a remote LED and/or sound a buzzer to alert someone that the antenna is blocked, and therefore signal is lost.

In a "Dual Antenna" installation, this logic output(s) is used to control Dual Antenna Arbitrator panel of coax switch (or switches) to switch the source inputs to the matrix switch from Antenna "**A**" to Antenna "**B**", and vice versa.

When used as simple "**RF Radiation Hazard**" logic output for a single Sea Tel TXRX antenna, this output could be used to suppress RF transmissions while the antenna is pointed where people would be harmed by the transmitted microwave RF power output. The SW2 output would be interfaced to the satellite modem to ***disable*** the TX output signal from the Satellite TXRX Modem whenever the antenna is within the RF Radiation Hazard zone(s).

When used for "**FCC TX Mute**" logic output for a single Sea Tel TXRX antenna, this output is used to suppress RF transmissions whenever the antenna is mis-pointed 0.5 degrees or more, is blocked, searching, targeting or unwrapping. The SW2 output would be interfaced to the satellite modem to ***disable/mute*** the TX output signal from the Satellite TXRX Modem. When the mute condition is due to antenna mis-pointing, it will not ***un-mute*** until the pointing error of the antenna is within 0.2 degrees. The default output is contact closure to ground when the antenna is mis-pointed, therefore provides a **ground** to "Mute" the satellite modem from the SW2 terminal of the Terminal Mounting Strip. If your satellite modem requires an **open** to "Mute", refer to SYSTEM TYPE parameter 16 value to reverse the output logic from the ACU.

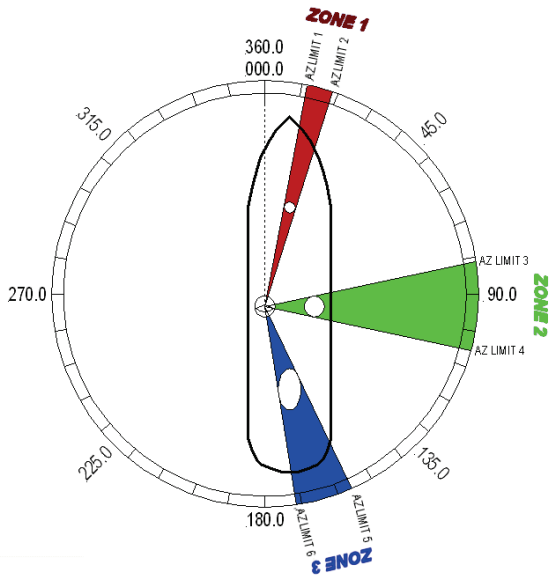
Programming instructions:

Determine the Relative AZ positions **where** blockage, or RF Radiation Hazard, exists. This may be done by monitoring the received signal level and the REL display readings while the ship turns or by graphing the expected blockage pattern. Elevation of the antenna in normal use also must be taken into consideration. A Mast or other structure may cause blockage at low elevation angles, but ***may not*** cause blockage when the antenna is at higher elevation angles where it is able to look over the structure. Up to four zones may be mapped. Only zones which are needed should be mapped (in AZ LIMIT pairs).

In unlimited antenna systems the Relative position of the antenna must have been calibrated by properly setting the Home Flag Offset (HFO) value in the PCU. The HFO calibrates Relative to display 0000 when the antenna is pointed in-line with the bow of the boat/ship (parallel to the bow).

Convert the relative readings to AZ LIMIT/EL LIMIT values by multiplying by 10. Enter the beginning of the ***first*** blockage region as AZ LIMIT 1 and the end of the region (clockwise direction from AZ LIMIT 1) as AZ LIMIT 2 parameters in the ACU. If needed, repeat setting AZ LIMIT 3 & 4 for a ***second*** ZONE and then AZ LIMIT 5 & 6 if a ***third*** ZONE is needed. All ***unneeded*** zone AZ LIMIT pairs ***must*** be set to 0000. Set the upper elevation limit of each blockage zone (also entered in degrees multiplied by 10).

EXAMPLE 1 - Three blockage Zones: A ship has a Sea Tel antenna mounted on the port side and an Inmarsat antenna mounted on the starboard side. A mast forward, the Inmarsat antenna to starboard and an engine exhaust stack aft form the three zones where satellite signal is blocked (as shown in the graphic). In this example zone 1 is caused by the mast, zone 2 is from the Inmarsat antenna, zone 3 is from the stack and zone 4 is not needed:



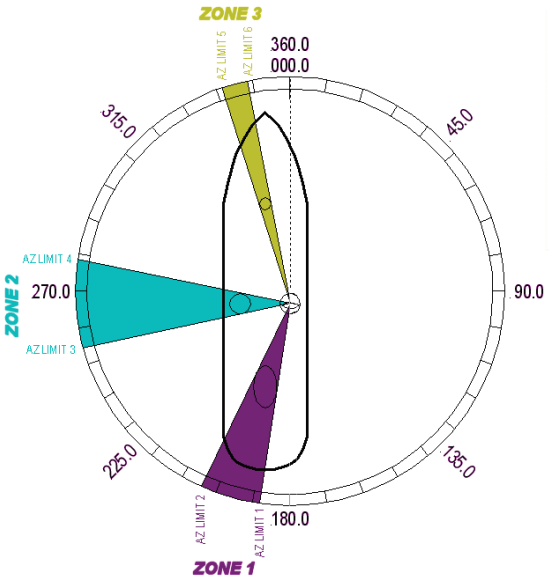
ZONE 1 begins (AZ LIMIT 1) at 12 degrees Relative and ends (AZ LIMIT 2) at 18 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 0120 and AZ LIMIT 2 value of 0180. In this case the mast height only causes blockage up to an elevation of 50 degrees, so we set EL LIMIT 12 to 0500. If the antenna is between these two AZ Limit points but the elevation is greater than 50 degrees, the antenna will no longer be blocked.

ZONE 2 begins (AZ LIMIT 3) at 82 degrees Relative and ends (AZ LIMIT 4) at 106 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 0820 and AZ LIMIT 4 value of 1060. In this case the Inmarsat antenna height only causes blockage up to an elevation of 12 degrees, so we set EL LIMIT 34 to 0120. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 3 begins (AZ LIMIT 5) at 156 degrees Relative and ends (AZ LIMIT 6) at 172 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 1560 and AZ LIMIT 6 value of 1720. In this case the stack antenna height only causes blockage up to an elevation of 36 degrees, so we set EL LIMIT 56 to 0360. If the antenna is between these two AZ Limit points but the elevation is greater than 36 degrees, the antenna will no longer be blocked.

ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

EXAMPLE 2 - Three blockage Zones, Dual Antenna configuration: A ship has 2 Sea Tel antennas, "Antenna A" mounted on the port side and "Antenna B" mounted on the starboard side. Antenna A is designated as the ***master*** antenna. The mast forward, Antenna B to starboard and the engine exhaust stack aft form the three zones where satellite signal is blocked from Antenna A. The SW2 logic output from Antenna A (ACU A) and Antenna B (ACU B) are used to control a "Dual Antenna Arbitrator" panel of coax switches which route satellite signal from the ***un-blocked*** antenna to the inputs of the matrix switch. If both antennas are tracking the same satellite, they will not both be blocked at the same time. The logic output will switch to provide satellite signal to the below decks equipment from Antenna A when it is ***not blocked*** and will switch to provide satellite signal from Antenna B whenever Antenna A ***is blocked***. The switches will not change state if ***both*** antennas are blocked, or if ***both*** are on satellite.



Antenna A is the same as the previous example and its ACU would be set to those AZ LIMIT values.

Antenna B ACU would be set to:

In this example Antenna B zone 1 is caused by the stack, zone 2 is from Antenna A, zone 3 is from the mast and zone 4 is not needed.

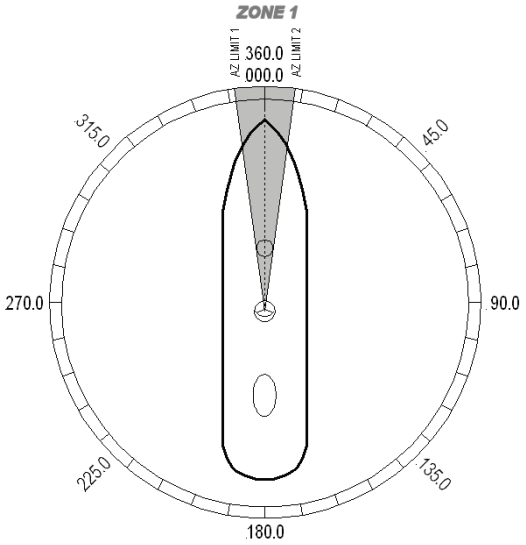
ZONE 1 begins (AZ LIMIT 1) at 188 degrees Relative and ends (AZ LIMIT 2) at 204 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 1880 and AZ LIMIT 2 value of 2040. In this case the stack height only causes blockage up to an elevation of 42 degrees, so we set EL LIMIT 12 to 0420. If the antenna is between these two AZ Limit points but the elevation is greater than 42 degrees, the antenna will no longer be blocked.

ZONE 2 begins (AZ LIMIT 3) at 254 degrees Relative and ends (AZ LIMIT 4) at 278 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 2540 and AZ LIMIT 4 value of 2780. In this case the Antenna B height only causes blockage up to an elevation of 12 degrees, so we set EL LIMIT 34 to 0120. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 3 begins (AZ LIMIT 5) at 342 degrees Relative and ends (AZ LIMIT 6) at 348 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 3420 and AZ LIMIT 6 value of 3480. In this case the mast height only causes blockage up to an elevation of 41 degrees, so we set EL LIMIT 56 to 0410. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

EXAMPLE 3 – One blockage Zone: A ship has a Sea Tel antenna mounted on the center line of the ship. A mast is forward and an engine exhaust stack is aft. In this example the Stack does ***NOT*** block the satellite, only the mast forward does. In this example zone 1 is caused by the mast, zone 2, 3 and 4 are not needed:



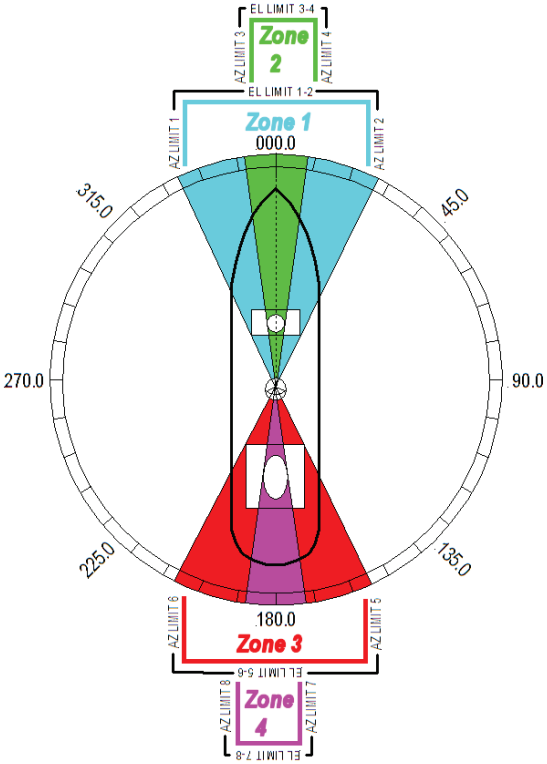
ZONE 1 begins (AZ LIMIT 1) at 352 degrees Relative and ends (AZ LIMIT 2) at 8 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 3520 and AZ LIMIT 2 value of 0080. In this case the mast height only causes blockage up to an elevation of 52 degrees, so we set EL LIMIT 12 to 0520. If the antenna is between these two AZ Limit points but the elevation is greater than 52 degrees, the antenna will no longer be blocked.

ZONE 2 is not needed. Enter AZ LIMIT 3 value of 0000 and AZ LIMIT 4 value of 0000. Set EL LIMIT 34 to 0000.

ZONE 3 is not needed. Enter AZ LIMIT 5 value of 0000 and AZ LIMIT 6 value of 0000. Set EL LIMIT 56 to 0000.

ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

EXAMPLE 4 - Overlaid Blockage Zones: A ship has a Sea Tel antenna mounted on the center line of the ship. A mast mounted on top of a deckhouse (like the picture below) is forward and an engine exhaust stack, also on a deckhouse, is aft. These two blockage areas have wide azimuth blockage at lower elevations and then a narrower azimuth area of blockage extends up to a higher value of elevation.



ZONE 1 begins (AZ LIMIT 1) at 334 degrees Relative and ends (AZ LIMIT 2) at 026 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 3340 and AZ LIMIT 2 value of 0260. In this case the mast height only causes blockage up to an elevation of 40 degrees, so we set EL LIMIT 12 to 0400. If the antenna is between these two AZ Limit points but the elevation is greater than 40 degrees, the antenna will no longer be blocked.

ZONE 2 begins (AZ LIMIT 3) at 352 degrees Relative and ends (AZ LIMIT 4) at 008 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 3520 and AZ LIMIT 4 value of 0080. In this case the mast height only causes blockage up to an elevation of 70 degrees, so we set EL LIMIT 34 to 0700. If the antenna is between these two AZ Limit points but the elevation is greater than 70 degrees, the antenna will no longer be blocked.

ZONE 3 begins (AZ LIMIT 5) at 155 degrees Relative and ends (AZ LIMIT 6) at 205 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 1550 and AZ LIMIT 6 value of 2050. In this case the mast height only causes blockage up to an elevation of 30 degrees, so we set EL LIMIT 56 to 0300. If the antenna is between these two AZ Limit points but the elevation is greater than 30 degrees, the antenna will no longer be blocked.

ZONE 4 begins (AZ LIMIT 7) at 173 degrees Relative and ends (AZ LIMIT 8) at 187 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 7 value of 1730 and AZ LIMIT 8 value of 1870. In this case the mast height only causes blockage up to an elevation of 55 degrees, so we set EL LIMIT 78 to 0550. If the antenna is between these two AZ Limit points but the elevation is greater than 55 degrees, the antenna will no longer be blocked. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

5.1. TX Polarity Setup

With the feed in the center of its polarization adjustment range, observe the transmit port polarity (vector across the short dimension of the transmit wave-guide).

If the transmit polarity in the center of the travel range is vertical, use the following entries:

2 Vertical Transmit Polarity

4 Horizontal Transmit Polarity

If the Transmit polarity in the center of the travel range is horizontal, use the following entries:

2 Horizontal Transmit Polarity

4 Vertical Transmit Polarity

5.2. TRACK DISP

This parameter set the selections that the user will see in the Tracking - Band Selection menu. Band Selection ***must*** be set to the appropriate selection for Tracking to operate properly.

Band selection controls the ***local*** logic output state of SW1 output terminal on the Terminal Mounting Strip PCB and ***remote*** C/Ku relays (or other switches) on the antenna pedestal.

The factory default selections and SW1 status for your 9797B is listed in the following table:

Setting	**Displayed band selection**	**ADE Band Select Parameters (Tone, Voltage & Aux Status)**	**TMS SW1 Status**
0000	C	Tone OFF, Volt 13, Aux 0	Open
	X	Tone OFF, Volt 18, Aux 0	Short
	KuLo	Tone OFF, Volt 13, Aux 1	Open
	KuHi	Tone OFF, Volt 18, Aux 1	Short

When the SW1 output is shorted to ground a current sink of 0.5 amps ***max*** is provided to control below decks band selection tone generators or coax switches. When SW1 output is open it is a floating output.

5.3. ACU Factory Default Parameter Settings – Series 97B & 00B Antennas

The following table shows the factory default parameters for the ACU interfaced to a Series 97B/00B Antenna. You may need to optimize some of these parameters. Refer to the individual parameter setting information in the Setup section of your ACU manual.

PARAMETER	C-Band DishScan	Ku-Band DishScan	My Parameters
EL TRIM	0		
AZ TRIM	0		
AUTO THRES	100		
EL STEP SIZE	0		
AZ STEP SIZE	0		
STEP INTEGRAL	0		
SEARCH INC	10	5	
SEARCH LIMIT	200	100	
SEARCH DELAY	30		
SWEEP INC	0040		
SYSTEM TYPE	0005 *		
GYRO TYPE	2		
POL TYPE	72		
POL OFFSET	30		
POL SCALE	90		
AZ LIMIT 1	0		
AZ LIMIT 2	0		
EL LIMIT 12	90		
AZ LIMIT 3	0		
AZ LIMIT 4	0		
EL LIMIT 34	90		
AZ LIMIT 5	0		
AZ LIMIT 6	0		
EL LIMIT 56	90		
5V OFFSET	0		
5V SCALE	0		
TRACK DISP	Refer to TRACK DISP parameter		
TX POLARITY	2		

**** Modem Lock input & Modem TX Mute functions are NOT set; refer to SYSTEM TYPE parameter information.***

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6. Functional Testing

6.1. ACU / Antenna System Check

1. Turn ACU power ON. Turn antenna Pedestal/RF Equipment power ON
2. Press **RESET** on the ACU front panel. Verify the display shows "SEA TEL INC - MASTER" and the ACU software version number. Wait 10 seconds for the display to change to "SEA TEL INC - REMOTE" and the PCU software version number. If the display shows "REMOTE INITIALIZING" wait for approximately 2 minutes for the antenna to complete initialization and report the Antenna Model and PCU software version.
3. Press the **NEXT** keys repeatedly to display the ***Ship***, ***Satellite***, ***Antenna*** and ***Status*** menus. This verifies that the displays change in the correct response to the keys.

If "**REMOTE NOT RESPONDING**" is displayed, or the displays do not change when the NEXT key is pressed, refer to the Troubleshooting Section of this manual.

6.2. Latitude/Longitude Auto-Update check

This verifies that the integrated GPS antenna is automatically updating the positional information.

1. Press the **NEXT** key until the Ship's menu is displayed.	**LAT 38N LON 122W** **HDG 123.4 123.4**
2. Press the **ENTER** key to isolate the Latitude entry menu.	**LAT 38N**
3. Press the **LEFT** arrow key to display a cursor under the numeric value.	**LAT 38N**
4. Press the **UP** arrow key to increment the displayed value.	**LAT 39N**
5. Press the **ENTER** key to submit change.	**LAT 39N**
6. If automatic updating is working properly the Longitude value display will return to the current ships Longitude position within a few seconds.	**LAT 38N**

6.3. Heading Following

Verify that the **heading** display in the ACU is following the ships Gyro Compass.

1. Press **NEXT** repeatedly until the SHIP MENU (Heading) display is displayed. When Left and right values are displayed, left is the response from the pedestal and right in the local input from the gyrocompass.
2. Have another person call out the Gyro Compass heading to you while you observe the Heading display. The Heading display should consistently be ***exactly*** the same as the Gyro Compass value. If the heading display changes incorrectly or the red ERROR LED illuminates on the front panel, refer to the Troubleshooting section of the ACU manual.
3. Return to normal operation OR Continue with the next functional test.

6.4. Azimuth & Elevation Drive

This verifies that the antenna moves in the correct response to the keys.

AZ 123.4 EL 056.7
REL 234.5 AGC 1234

1. Press the ***NEXT*** key until the Antenna Menu is displayed.
2. If tracking or searching status is enabled, press the TRACK key.
3. Press the **RIGHT** arrow key repeatedly and verify that the antenna physically moves up (CW) in Azimuth and that the display accurately reflects that movement.

4. Press the **LEFT** arrow key repeatedly and verify that the antenna physically moves down (CCW) in Azimuth and that the display accurately reflects that movement.
5. Press the **UP** arrow key repeatedly and verify that the antenna physically moves up (CW) in Elevation and that the display accurately reflects that movement.
6. Press the **DOWN** arrow key repeatedly and verify that the antenna physically moves down (CCW) in Elevation and that the display accurately reflects that movement.

6.5. Four Quadrant Test Tracking

A Four Quadrant Tracking Test is the best way to test tracking (regardless of which tracking mode is being used). This tests each of the 4 quadrants (UP, DOWN, LEFT & RIGHT of peak signal AZ/EL pointing) to assure that the tracking mode being used drives the dish back to peak satellite signal level. **Note**: Return to peak should take about the same amount of time from each of the four quadrants.

1. Ensure tracking receiver parameters are set correctly and that system is on satellite with peak signal (AGC above threshold).
2. Ensure tracking LED is off – If not press the TRACK **TRACK** key to toggle tracking off
3. Press the NEXT **NEXT** arrow key a few times until Antenna menu is displayed
4. Note the current Azimuth and AGC values.
5. Press and hold the **RIGHT** arrow key to drive Azimuth down until displayed AGC drops 100 counts (approx. 2-3 dB) (Do not drive antenna so far that AGC falls below threshold)
6. Press the TRACK **TRACK** key to re-enable tracking.
7. Monitor the Azimuth and AGC Values for the next 20-30 seconds.
8. Verify the Azimuth and AGC return to the values noted in step 4.
9. Verify the amount of time it took for tracking to bring AGC back to peak is within the specifications

   ** Nominal time to get back to peak is 8-30 seconds You should also be able to observe the DishScan tracking decisions being carried out by ACU by viewing either a 2, 4, 6, or 8 in the bottom left-hand side of the Azimuth Sub-menu display screen. A normal displayed response would be opposite than that of the axis driven, i.e. for an antenna driven up (CW) is azimuth you would expect to see a majority of 4's being displayed indicating DishScan senses signal strength higher down in azimuth, therefore sending the Azimuth Down command to PCU.

   A flashing '2' indicates an Elevation Down command

   A flashing '8' indicates an Elevation Up command

   A flashing '4' indicates an Azimuth Down (CCW) command

   A flashing '6' indicates an Azimuth Up (CW) command

   A flashing '0' indicates No antenna drive command
10. Repeat steps 2-9 driving antenna the other 3 directions, (Replace Step 5 with below steps as each direction is tested)
11. Using the **LEFT** arrow to drive antenna down (CCW) in Azimuth
12. Using the **DOWN** arrow key to drive antenna down in Elevation
13. Using the **UP** arrow key to drive antenna up in Elevation

If problems are encountered with tracking recovery refer to 123400_C DishScan document available on our dealer support site..

7. Maintenance and Troubleshooting

This section describes the theory of operation to aid in troubleshooting and adjustments of the antenna system. Also refer to the Troubleshooting section of your ACU manual for additional troubleshooting details.

	***WARNING**: Electrical Hazard – Dangerous AC Voltages exist in the Breaker Box and the Antenna Pedestal Power Supply. Observe proper safety precautions when working inside the Antenna Breaker Box or Power Supply.*
	***WARNING**: RF Radiation Hazard - This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**
	WARNING**: RF Radiation Hazard - Prior to working on the stabilized antenna system, the power to the **transmit/receive** equipment must be locked out and tagged. **Turning OFF power to the Antenna Control Unit does NOT turn Transmit power output OFF. **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**
	***WARNING**: RF Radiation Hazard - When the transmit/receive system is in operation, no one should be allowed anywhere within the radiated beam being emitted from the reflector.* **The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.**

7.1. Warranty Information

Sea Tel Inc. supports its Series 97, 00, 06 and 07 systems with a ***ONE YEAR*** warranty on parts and labor.

What's Covered by the Limited Warranty?

The Sea Tel Limited Warranty is applicable for parts and labor coverage to the complete antenna system, including all above-decks equipment (radome, pedestal, antenna, motors, electronics, wiring, etc.) and the Antenna Control Unit (ACU).

What's ***NOT*** Covered by the Limited Warranty?

It does ***not*** include Transmit & Receive RF Equipment, Modems, Multiplexers or other distribution equipment, whether or not supplied by Sea Tel commonly used in Satellite Communications (TXRX) Systems. These equipments are covered by the applicable warranties of the respective manufacturers.

Factory refurbished components used to replace systems parts under this warranty are covered by this same warranty as the original equipment for the balance of the original warranty term, or ninety (90) days from the date of replacement, whichever occurs last. Original Installation of the Series 97 system must be accomplished by or under the supervision of an authorized Sea Tel dealer for the Sea Tel Limited Warranty to be valid and in force.

Should technical assistance be required to repair your system, the first contact should be to the agent/dealer you purchased the equipment from.

Please refer to the complete warranty information included with your system.

7.2. Recommended Preventive Maintenance

Ensure that all of the normal operating settings (LAT, LON, HDG, SAT and al of the Tracking Receiver settings) are set correctly. Refer to the Functional Testing section to test the system.

7.2.1. Check ACU Parameters

Assure that the parameters are set correctly (you may wish to record them in the Factory Default Settings, in section 5 of this manual).

7.2.2. Latitude/Longitude Auto-Update check

Refer to the Latitude & Longitude Update check procedure in the Functional Testing section of this manual.

7.2.3. Heading Following

Refer to the Heading Following verification procedure in the Functional Testing section of this manual.

7.2.4. Azimuth & Elevation Drive

Refer to the Azimuth & Elevation Drive check procedure in the Functional Testing section of this manual.

7.2.5. Test Tracking

Refer to the four quadrant Tracking check procedure in the Functional Testing section of this manual.

7.2.6. Visual Inspection - Radome & Pedestal

Conduct a good, thorough, visual inspection of the radome and antenna pedestal. Visually inspect the inside surface of the radome top and of the antenna pedestal. Look for water or condensation, rust or corrosion, white fiberglass powder residue, loose wiring connections, loose hardware, loose or broken belts or any other signs of wear or damage.

1. Radome Inspection - All the radome flanges are properly sealed to prevent wind, saltwater spray and rain from being able to enter the radome. Re-seal any open ("leaky") areas with marine approved silicone sealant. If heavy condensation, or standing water, is found inside the radome, isolate and seal the leak, and then dry out the radome. Small (1/8 inch) holes may be drilled in the base pan of the radome to allow standing water to "weep" out.
2. Antenna Pedestal Inspection - The shock/vibration springs and/or wire rope Isolators should not be frayed, completely compressed, or otherwise damaged. The plated and painted parts should not be rusted or corroded. The harnesses should not be frayed and all the connectors should be properly fastened and tightened. All hardware should be tight (no loose assemblies or counter-weights). Replace, re-coat, repair and/or tighten as necessary.

7.2.7. Mechanical Checks

Turn the pedestal power supply OFF

1. Inspect inside of radome for signs that the dish or feed have been rubbing against the inside of the fiberglass radome.
2. Rotate the pedestal through its full range of azimuth motion. The antenna should rotate freely and easily with light finger pressure.
3. Rotate the pedestal through full range of elevation rotation. The antenna should rotate freely and easily with light finger pressure.
4. Rotate the pedestal through full range of cross-level rotation. The antenna should rotate freely and easily with light finger pressure.
5. Rotate the level cage through the full 90 degrees of rotation from CCW stop to CW stop. The level cage antenna should rotate freely and easily with light finger pressure. Attached cables should not cause the cage to spring back more that a few degrees from either stop when released.
6. Inspect all drive belts for wear (black dust on/under the area of the belt).
7. Inspect AZ Drive chain. IF chain is beginning to show signs of rust or corrosion, apply a ***light*** coat of light duty oil to the chain. Wipe excess oil off to leave a light coating on the chain. **DO NOT *over-lubricate***.

7.2.8. Check Balance

Check the balance of the antenna, re-balance as needed (refer to the Balancing the Antenna procedure below).

7.2.9. Observe Antenna Initialization

Observe the Antenna Initialization as described in the Troubleshooting section below.

7.3. Troubleshooting

7.3.1. Theory Of Stabilization Operation

The antenna system is mounted on a three axis stabilization assembly that provides free motion with 3 degrees of freedom. This assembly allows the inertia of the antenna system to hold the antenna pointed motionless in inertial space while the ship rolls, pitches and yaws beneath the assembly. Three low friction torque motors attached to each of the three free axes of the assembly provide the required force to overcome the disturbing torque imposed on the antenna system by cable restraints, bearing friction and small air currents within the radome. These motors are also used to re-position the antenna in azimuth and elevation.

The Pedestal Control Unit (PCU) uses inputs from the level cage sensors to calculate the amount of torque required in each axis to keep the antenna pointed within +/-0.2 degrees. The primary sensor input for each loop is the rate sensor mounted in the Level Cage Assembly. This sensor reports all motion of the antenna to the PCU. The PCU immediately responds by applying a torque in the opposite direction to the disturbance to bring the antenna back to its desired position. Both the instantaneous output of the rate sensor (Velocity Error) and the integrated output of the rate sensor (Position Error) are used to achieve the high pointing accuracy specification.

The calculated torque commands are converted to a 5 volt differential analog signal by a Digital to Analog converter (D/A) and sent to each of three Brush-Less Servo Amplifiers. These amplifiers provide the proper drive polarities and commutation required to operate the Brush-Less DC Servo Motors in torque mode. The Torque acting on the mass of the antenna cause it to move, restoring the rate sensors to their original position, and closing the control loop.

Since the rate sensors only monitor motion and not absolute position, a second input is required in each axis as a long term reference to keep the antenna from slowly drifting in position. The Level and Cross Level reference is provided by a two axis tilt sensor in the level cage assembly. The Azimuth reference is provided by combining the ships gyro compass input and the antenna relative position.

7.3.2. Antenna Initialization (Series 97B & Series 00)

Turn the pedestal power supply ON. The brakes on the Elevation and Cross-Level motors will release.. Brake release power supply control circuit supplies 24 VDC to the brakes initially (5-10 seconds) and then reduces the voltage to 12VDC. The PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps (listed below) to initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions.

Initialization is completed in the following phases, each phase must complete properly for the antenna to operate properly (post-initialization). Observe the Initialization of the antenna pedestal.

Step 1. The level platform motor drives the Level Cage CW, issuing extra steps to assure that the cage is all the way to the mechanical stop. Then the Level Cage will be driven exactly 45.0 degrees CCW.

Step 2. Elevation axis then activates - Input from the LV axis of the tilt sensor is used to drive the Elevation of the equipment frame to bring the tilt sensor LV axis to level. This step takes approximately 10 seconds and will result in the dish being at 45.0 degrees in elevation. The level cage may still be tilted left or right at this time.

Step 3. Cross-Level axis activates - Input from the CL axis of the tilt sensor is used to drive Cross-Level of the equipment frame to bring the cross-level axis of the tilt sensor to level (this results in the tilt of the Cross-Level Beam being level). This step takes approximately 10 seconds.

Step 4. Azimuth axis activates - Antenna drives CW in azimuth until the “Home Flag” signal is produced. This signal is produced by a Home Switch hitting a cam (or by a Hall Effect sensor in close proximity to a Magnet). After another 10 second wait, the antenna will report its version number at the Antenna Control Unit (ACU).

This completes the phases of initialization. At this time the antenna elevation should 45.0 degrees and Relative azimuth should be at home flag (home switch engaged on the home flag cam).

If any of these steps fail, or the ACU reports model "**xx**97", re-configure the PCU as described in the this chapter. If initialization still fails, this indicates a drive or sensor problem, refer to the Troubleshooting section.

7.3.3. Troubleshooting using DacRemP

While troubleshooting a Sea Tel 3-Axis Antenna System, you must classify the fault you are dealing with as a failure within one of 3 major system functions, Targeting, Stabilization, and Tracking. Should there be a failure with any one of these functions, your system will not operate properly. A few simple checks may help determine which fault (if any) that you are dealing with. The matrix below lists some test(s) and which of the DacRemP graph selection would be best to use to identify a fault. The end of this chapter contains examples on how to use DacRemP to diagnose a fault.

Targeting: is the ability to accurately point the antenna to an angular position in free space and is controlled by the ACU. (Does the system drive to the Azimuth, Elevation, and Polarity positions within 1 degree of the desired satellite?)

Stabilization: is the process of de-coupling the ships motion from the antenna and is controlled by the PCU. (Does the system maintain the satellite link after turning off TRACKING?)

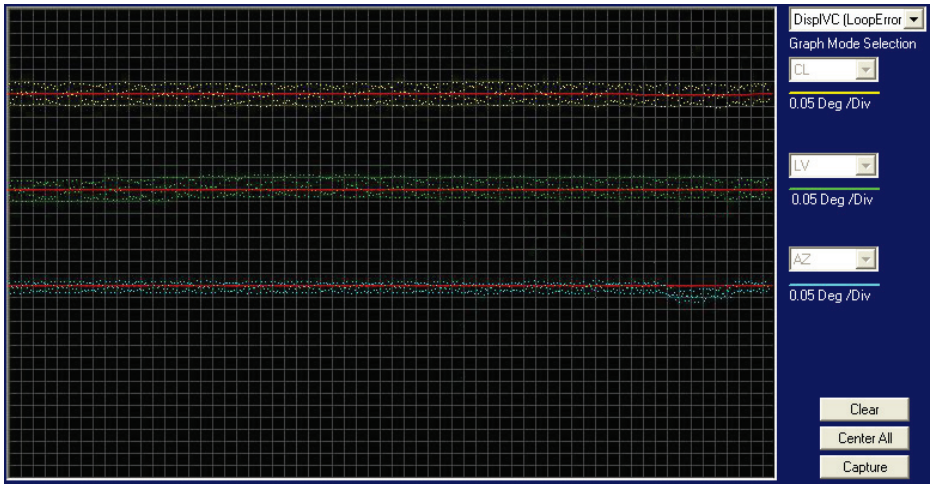
Tracking: is the process of issuing fine adjustments to the **pointing** angle of the antenna to optimize the received signal level and is controlled by the ACU. (Does the system pass a four quadrant-tracking test?)

Functional Test(s)	DacRemP Graph Selection to use	System Function(s)
Four Quadrant Tracking.	ADMC (Position)	Tracking
Azimuth Encoder Verification.	ADMC (Position)	Targeting
Sea Trial	ADMC (Position)	Targeting Tracking Stabilization
Side Lobe Plots	ADMC (Position)	Tracking
Targeting Alignment (AZ & EL Trims)	ADMC (Position)	Targeting
Determine Blockage Mapping	ADMC (Position)	Tracking
Unwrap recovery (Limited Az systems only)	ADMC (Position)	Stabilization
Pedestal Gain Verification	DISPIVC (Loop Error)	Stabilization
Home switch (flag) verification (Unlimited Az systems only)	DISPV (Ref)	Stabilization
Remote Tilt Verification	DISPV (Ref)	Targeting Stabilization
Level cage alignment Verification (sensor alignment)	DISPV (Ref)	Targeting Stabilization
Rate Sensor Output Verification	DISPW (Rate)	Stabilization
Level and CL fine balance Verification	DISPTC (Drive)	Stabilization
AZ Friction Torque Test	DISPTC (Drive)	Stabilization
DishScan Drive/Phase	DishScan XY	Tracking Stabilization

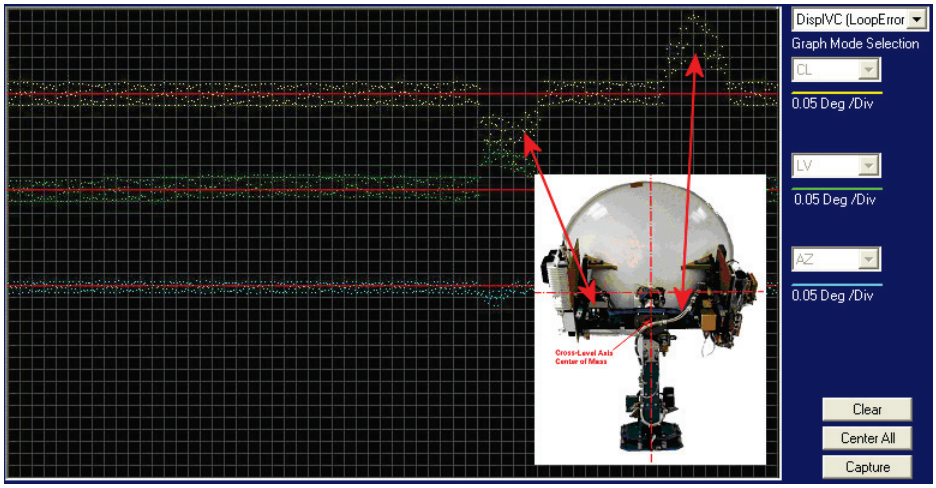
7.3.4. Antenna Loop Error Monitoring

The DacRemP **DISPIVC** graph chart provides a means for monitoring the accumulated velocity errors of the antenna for diagnostic purposes. If this error is excessive, it indicates external forces are acting on the antenna. These forces may be the result of but not restricted to static imbalance, excessive bearing friction, cable binding, or wind loading. If these forces cause the antenna to mis-point by more than 0.5˚ from the desired position the PCU will flag a "Stab Limit" error.

- To view the position error, select the DisplVC (LoopError graph chart.

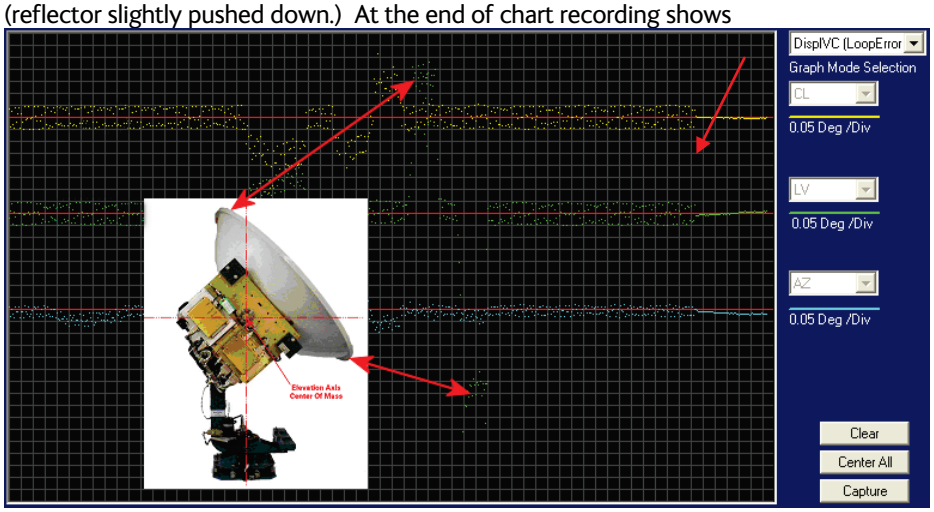


- This chart displays sensed axis errors via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 0.05°/ vertical division.
- The normal trace average will plots it's display ± 3 divisions from the red reference line. Any trace line average plotted above this is of concern and troubleshooting required. The example below shows the forces exerted onto the antenna as a resultant of DishScan Drive. The example below shows the results of various forces put upon antenna.



- Cross-Level Axis physically moved CCW (down to the left.) and then CW (up to the right.)

Elevation Axis physically moved CW. (reflector slightly pushed up) and then physically moved CCW. (reflector slightly pushed down.) At the end of chart recording shows

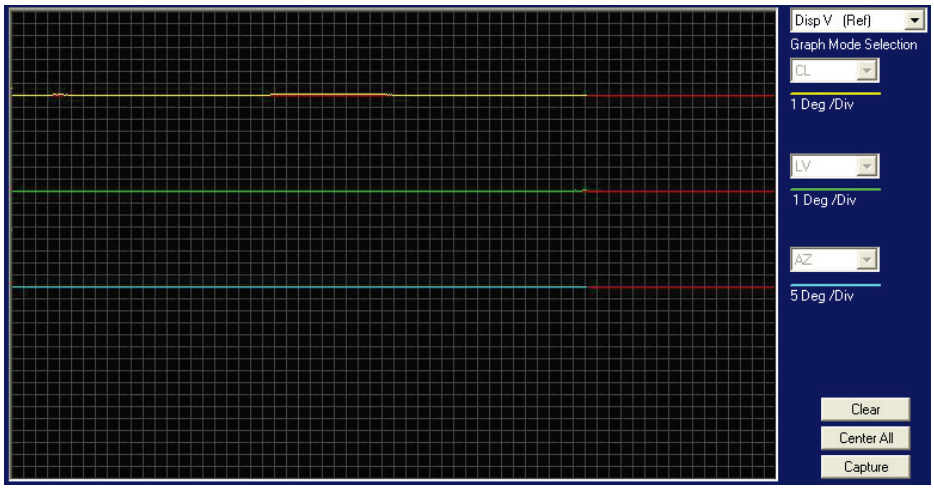


- DishScan Drive turned Off, notice the lack of accumulated IVC errors.

7.3.5. Reference Sensor Monitoring

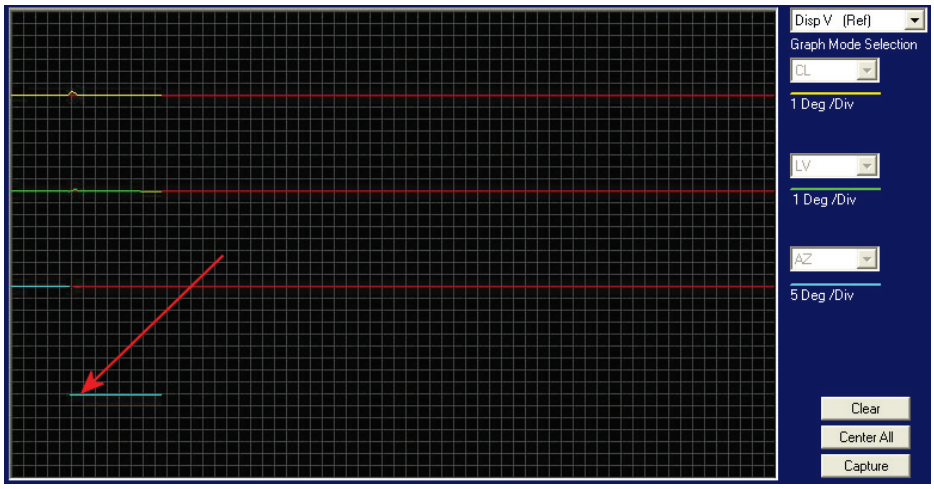
The DacRemP **DISPV** graph chart provides a means for monitoring the output of the 2 Axis Tilt Sensor and the Home Switch sensor for diagnostic purposes. The Tilt sensor (located inside the Level Cage Assembly) is the primary input for the antenna's reference to the horizon (0˚ Elevation and 90˚ Cross-Level). While the Home Switch Sensor (located at the antenna base) is used to calibrate the antenna's position relative to the vessels BOW.

- To view the reference sensors, select the Disp V (Ref) graph chart.
- This chart displays the output of the Tilt Sensor via two traces, CL (Cross Level), LV (Elevation) at a fixed 1°/ vertical division, and the home flag logic level via a single trace, AZ (Azimuth).



- The normal trace display for the Tilt Sensor, after performing remote tilt calibration, will be ± 4 divisions from the red reference line. Any trace line average plotted above this is of concern and troubleshooting required. See below for a screen capture of an antenna that is Level in both the Cross-Level and Elevation Axis.
- The Cross Level Tilt display should plot on the red reference line when the level cage is level, referenced to the horizon. It should decrease (plots below red line) when the antenna is tilted to the left and increase (plots above red line) when tilted to the right. See below for a screen capture of an abnormal CL trace Plot, it is an indication that the antenna that is either listed to the right approx. 4 degrees or the PCU requires to much CL tilt bias.

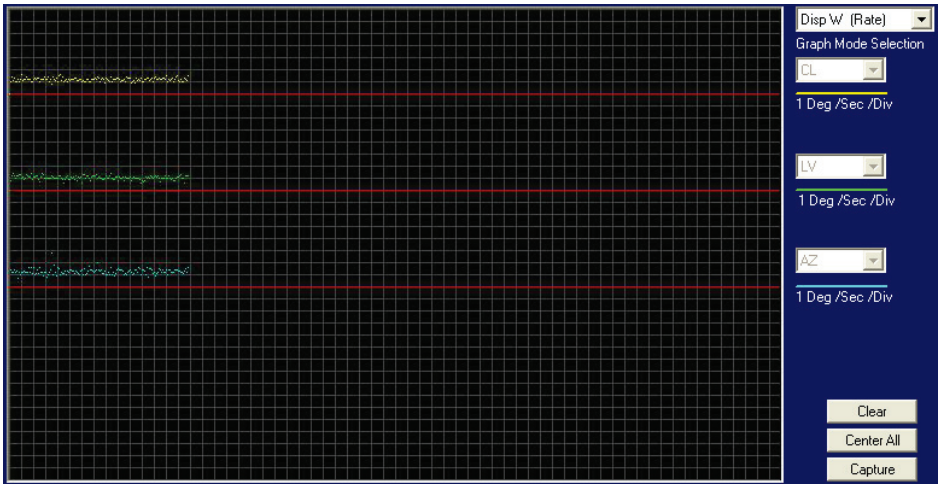
- The Level tilt display should plot on the red reference line when the level cage is level, referenced to the horizon. It should decrease (plots below red line) when the antenna is tilted forward (EL down) and increase (plots above red line) when tilted back (EL up).
- The Azimuth display for the Home Switch will normally display a logic level high (plots directly on Red reference line after clicking on the Center All button) when the home flag is NOT engaged and changing to a logic level low when engaged. See below for a screen capture of an antenna that was driven so that the Home Flag switch is engaged.



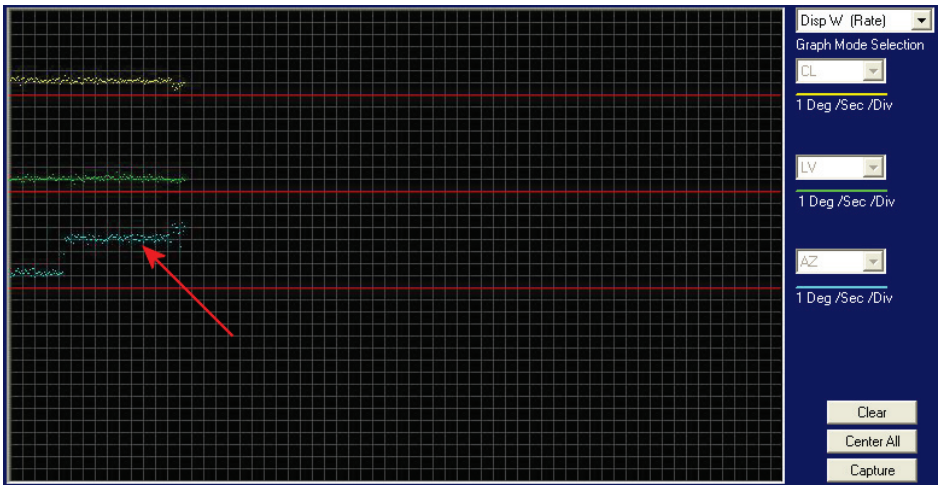
7.3.6. Open Loop Rate Sensor Monitoring

The DacRemP **DISPW** graph chart provides a means for monitoring the output of the 3 solid state rate sensors (located inside the Level Cage Assembly) for diagnostic purposes. The rate sensors are the primary inputs to the PCU for stabilization.

- To monitor the rate sensors, select the Disp W (Rate) graph chart
- This chart displays sensed output from the 3 rate sensors via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 1°/Second/vertical division.
- A normal trace display will be ± 1 divisions from the red reference line. The example shown below shows an antenna that is NOT currently sensing motion in any axis.

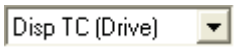


- The Cross Level display should decrease (plots below red line) as the antenna is tilted to the left and increase (plots above red line) as the antenna tilted to the right.
- The Level display should decrease (plots below red line) as the antenna is tilted forward and increase (plots above red line) as the antenna is tilted back.
- The Azimuth display should decrease (plots below red line) as the antenna is rotated CCW and increase (plots above red line) as the antenna is rotated CW. In the example below, the output of the Azimuth rate sensor is plotted above the reference line, indicating that the antenna was driven CW in Azimuth. Due to the in-practicality of driving an axis at a consistent rate, verification of rate sensor output is, for the most part restricted to a positive or negative response of the Level Cage movement (plotting above or below the red reference line of each axis).

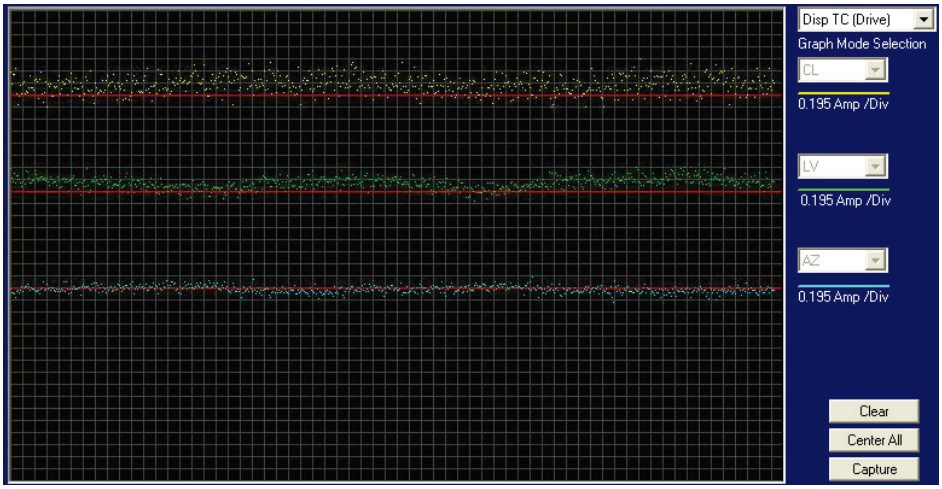


7.3.7. Fine Balance and Monitoring Motor Drive Torque

The DacRemP **DISPTC** graph chart provides a means for monitoring torque commands required for each motor for diagnostic purposes and verifying antenna balance. By observing each trace, the required drive of the antenna via the motor driver PCB may be established.

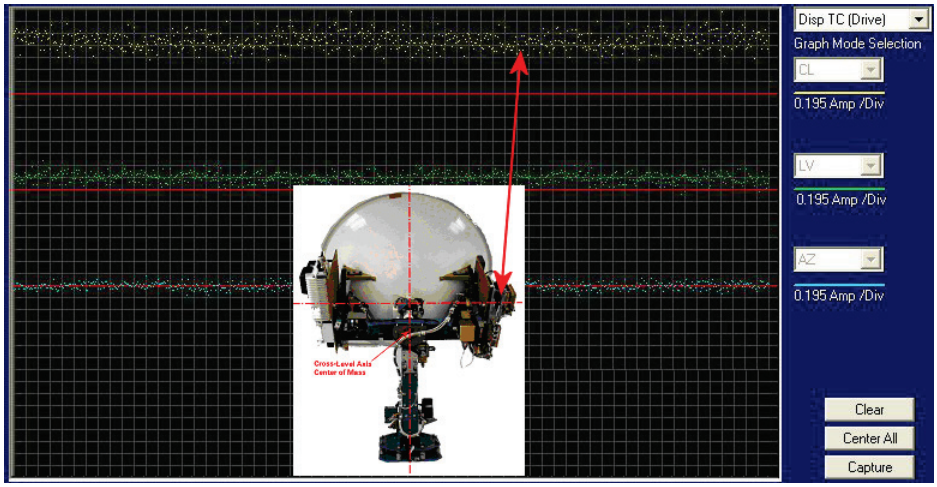
- To view the Torque Commands, select the 

graph chart.
- This chart displays the Torque Command errors for each axis via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 0.195amps/vertical division.

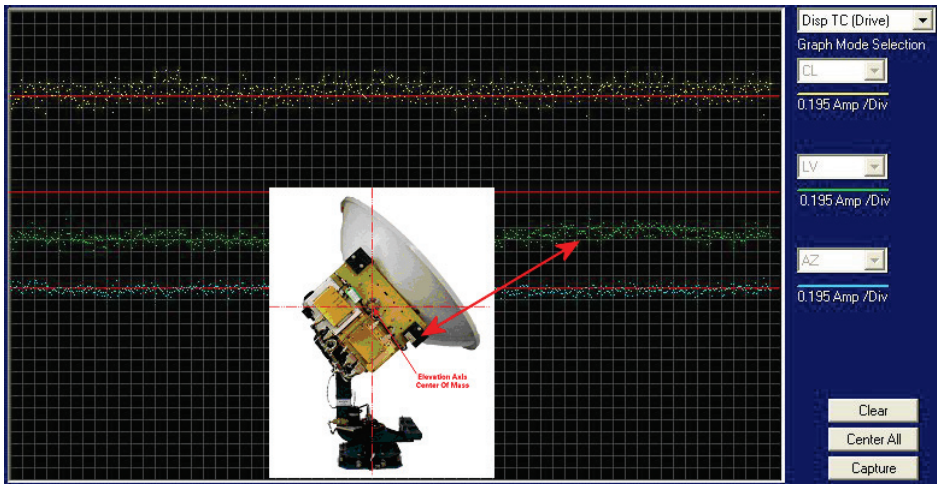


- A normal trace display will be ± 1 divisions from the red reference line while under calm sea conditions and with DishScan Drive turned off. See example below
- The Cross Level display will decrease (plots below red line) as the antenna requires drive to the left and increase (plots above red line) as the antenna requires to the right.

  Example: The antenna pictured in the screen capture below is imbalanced so that it is "Right Heavy". The CL trace is plotting above the red reference line (indicating that drive CCW is required to maintain a 90˚Cross-Level position).



- The Level display should decrease (plots below red line) as the antenna requires drive forward (Up in elevation) and increase (plots above red line) as the antenna requires drive back (Down in elevation).
- Example: The antenna pictured in the screen capture below is imbalanced so that it is "Front Heavy". The LV trace is plotting above the red line (indicating that drive CW is required to maintain the current elevation position).

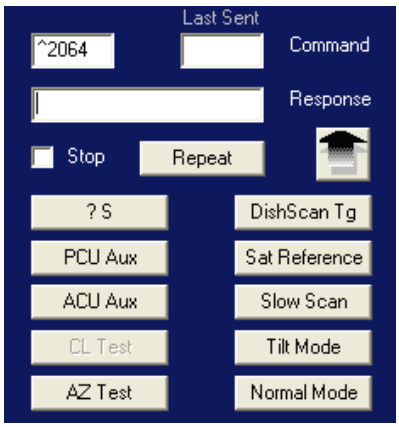


- The Azimuth display should decrease (plots below red line) as the antenna is driven CCW and increase (plots above red line) as the antenna is rotated CW.

7.3.8. Open Loop Motor Test

The DacRemP **Comm Diagnostics** Window provides a means to enter in Remote Commands for driving each individual torque motor to test that motors functionality. By driving each axis and observing the resulting motion of the antenna, a coarse operational status of the motor and motor driver may be established.

- To manually drive the motors, select the "**Comm Diagnostics**" window under to the Tools submenu or Press "CTRL + C"
- Using the small field in the upper left hand corner of the window, type in the remote command and verify the motor appropriately drives in the direction commanded.
- To drive the Cross Level motor, key in ^1064, ^1128 or ^1192 and press **ENTER** to drive the Cross Level axis LEFT, OFF or RIGHT respectively.
- To drive the Level motor, key in ^2064, ^2128 or ^2192 and press **ENTER** to drive the level axis FORWARD, OFF or BACKWARD respectively.
- To drive the Azimuth motor, key in ^3064, ^3128 or ^3192 and press **ENTER** to drive the azimuth axis CW, OFF or CCW.



7.3.9. To Disable/Enable DishScan

To be able to use Step Track, or to revert to Conscan, as your active tracking mode you will have to disable DishScan.

Select the **DISHSCAN** parameter window on the ACU:

1. Press the RIGHT arrow, then press the UP arrow and last press the ENTER key to turn DishScan mode ON.
2. Press the RIGHT arrow, then press the DOWN arrow and last press the ENTER key to turn DishScan Mode OFF.

If you change this remote parameter, you must save the change using REMOTE PARAMETERS.

If DishScan is **OFF** and the **Step Integral** parameter is set to **0000**, you will get a ***constant*** ERROR **0016** (DishScan error) and you will see ***zeros*** flashing in the lower left of the Azimuth and Elevation ENTRY menu displays. This is a visual indication that DishScan is turned OFF.

7.3.10. Satellite Reference Mode

The ships gyro compass input to the ACU may be accurate and stable in static conditions and yet may NOT be accurate or stable enough in some underway dynamic conditions. If there is no gyro compass or if the input is corrupt, not stable or not consistently accurate the tracking errors will become large enough to cause the antenna to be mis-pointed off satellite.

Satellite Reference Mode will uncouple the gyro reference from the azimuth rate sensor control loop. This decoupling of the Gyro source only happens 5 minutes after an azimuth command has been sent to the antenna by means of an AZ target command, a search pattern initiated, or the a Satellites longitudinal position is targeted. When operating in Satellite Reference Mode changes in ships gyro reading will reflect its changes to the ACU's display but will not directly affect the azimuth control loop. The Pedestal Control Unit will stabilize the antenna based entirely on the azimuth rate sensor loop and the tracking information from DishScan. This will keep the azimuth rate sensor position from eventually drifting away at a rate faster than the tracking loop can correct by using the tracking errors to regulate the rate sensor bias.

Satellite Reference Mode can be used as a diagnostic mode to determine if tracking errors are caused by faulty gyro inputs.

Satellite Reference Mode ***MUST be used when:***

- No Gyro Compass is available
- Frequent or constant ACU Error Code 0001 (Gyro Compass has failed)
- Gyro Compass output is NMEA heading
- Flux Gate Compass is being used
- GPS Satellite Compass is being used

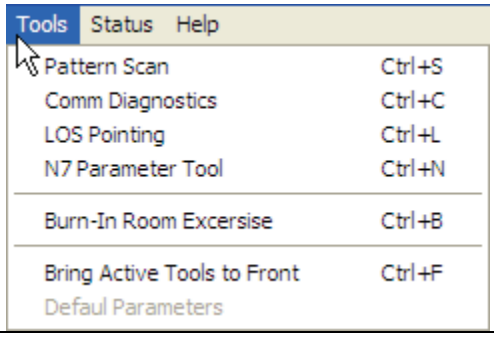
To view, or change, the Satellite Reference Mode status, select the SAT REF remote parameter:

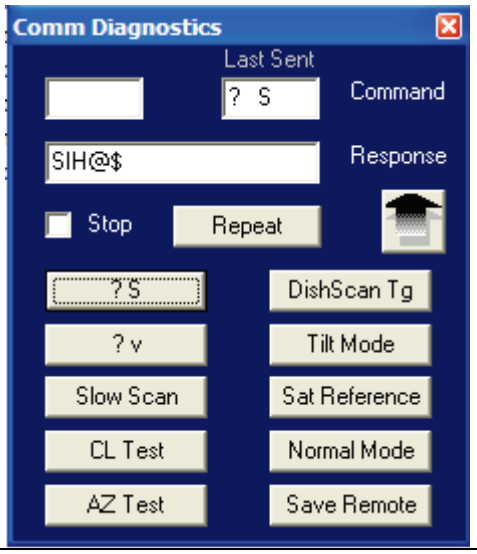
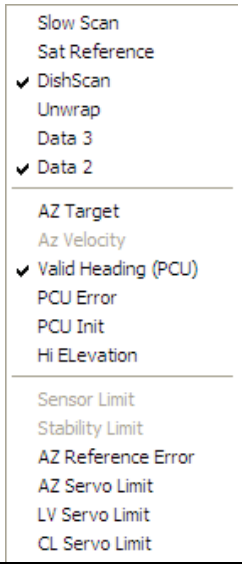
1. Press the RIGHT arrow, then press the UP arrow and last press the ENTER key to turn Satellite Reference Mode ON.
2. Press the RIGHT arrow, then press the DOWN arrow and last press the ENTER key to turn Satellite Reference Mode OFF.

If you change this remote parameter, you must save the change using REMOTE PARAMETERS.

7.3.11. To Read/Decode an ACU Error Code 0008 (Pedestal Function Error):

An Error Code 8 as reported by the ACU is an indication that the above decks equipment has experienced an error. One of the functions available within the "**Comm Diagnostics**" tool window provides the means to read and decode the actual discreet Pedestal Function Error.

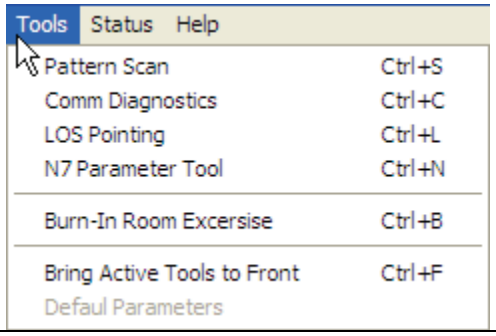
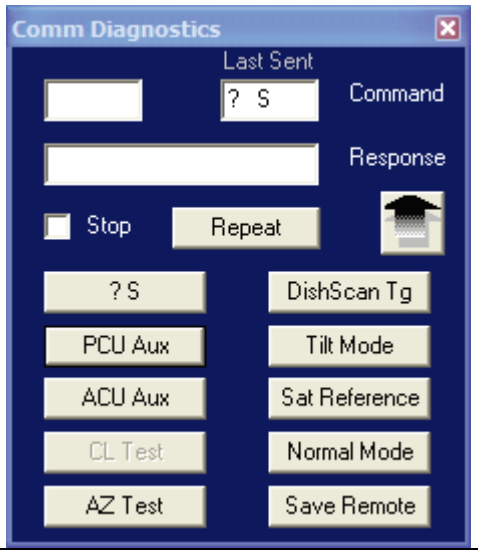
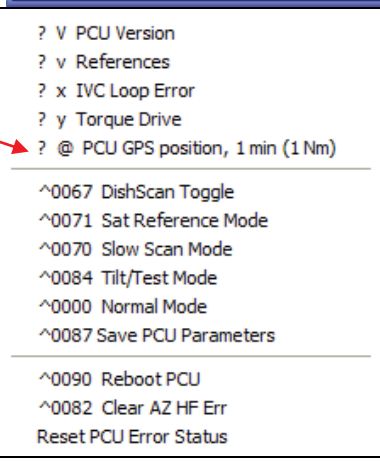
1. Select the "**Comm Diagnostics**" window under to the Tools submenu or Press "CTRL + C"	

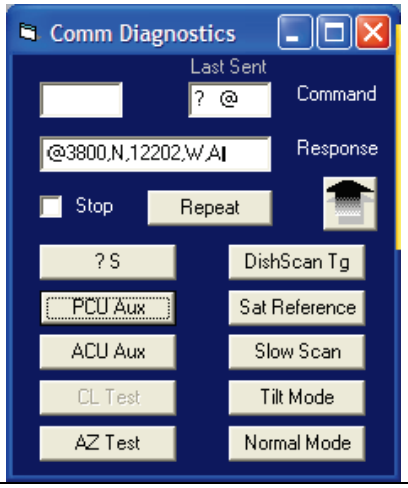
2. Left mouse click on the ?S icon.	
3. Right mouse click on the ?S icon. This will display a list box with the status of the above decks pedestal filtered into 3 sections. Items preceded with a check marks indicate a flagged status. See matrix below for further information on each state.	

State	Description
PCU Status (Word 1)	
Slow Scan	Indicates antenna is in a specialized mode, Slow Scan, which is required when ever a test requires driving the antenna >5˚/sec
Sat Reference	Indicates that satellite reference mode is enabled.
DishScan	Indicates that DishScan Drive is enabled.
Unwrap	Indicates that the antenna is currently in an "Unwrap" state. This is not a valid error for unlimited azimuth antenna systems
Data 3	Indicates active communication between above decks and below decks equipment at the time of query
Data 2	Indicates active communication between above decks and below decks equipment at the time of query
PCU Status (Word 2)	
Az Target	Indicates the antenna is currently targeting a pre-determined azimuth position
Az Velocity	**Not a valid state**
Valid Heading (PCU)	Indicates that the PCU has received and integrated the heading value from the ACU into the Azimuth Stabilization Loop. This is NOT an indication of a proper Heading integration into ACU.
PCU Error	Indicates that one or more errors have been reported by the above decks equipment.
PCU Init	Indicates that the above decks equipment is currently performing an Initialization sequence
Hi Elevation	Indicates that the above decks equipment is operating an Elevation Position higher than 83˚
PCU Error Status (Word 3)	
Sensor Limit	**Not a valid state**
Stability Limit	Indicates that the above decks equipment is mis-pointed from its intended target by more than 0.5˚. (FCC Tx Mute Compliance)
AZ Reference Error	Indicates a failure to integrate one the reference inputs within the Azimuth Stabilization Loop.
AZ Servo Limit	Indicates the current draw through the Azimuth Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation
LV Servo Limit	Indicates the current draw through the Elevation Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation
CL Servo Limit	Indicates the current draw through the Cross-Level Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation

7.3.12. Remote GPS LAT/LON Position:

The above decks equipment has an integrated on board Furuno GPS antenna system. The Latitude and Longitude position information provided are utilized to calculate the Azimuth, Elevation, Cross-level and Polarity pointing angles of the desired satellite. The DacRemP "**Comm Diagnostics**" Window provides a means to query the GPS antenna to verify proper operation. The procedure below describes this process.

1. Select the "**Comm Diagnostics**" window under to the Tools submenu or Press "CTRL + C"	
2. Left mouse click on the PCU Aux icon.	
3. Left Mouse click on the "?@ PCU GPS position, 1 min (1 Nm)"	

4. In the "Response" window verify proper GPS position to within 1 nautical mile of your current position. The Latitude & Longitude position of the GPS will be displayed in the following format: "@ LAT,N,LON,E,A" Where LAT and LON are in degrees and minutes, LAT will be followed by N or S (North or South), LON will be followed by E or W (East or West), then a status character and finally a checksum character.	
Furuno default value is in Japan at 34.4N 135.2E (@3444,N,13521,E,,_). After acquiring a good fix at Sea Tel the string is @3800,N,12202,W,Aˆ for our 38N 122W Latitude and Longitude position. The status character tells you the status of the GPS. "," (Comma) = GPS has NOT acquired a proper fix, "**N**" = GPS fix is NOT valid "**A**" = GPS has acquired a valid fix.	

7.4. Maintenance

7.4.1. Balancing the Antenna

The antenna and equipment frame are balanced at the factory however, after disassembly for shipping or maintenance, balance adjustment may be necessary. The elevation and cross-level motors have a brake mechanism built into them, therefore, ***power*** must be ON to release the brakes and **DishScan *and antenna drive*** must be OFF to balance the antenna. . ***Do NOT remove any of the drive belts***. Balancing is accomplished by adding or removing balance trim weights at strategic locations to keep the antenna from falling forward/backward or side to side. The antenna system is not pendulous so 'balanced' is defined as the antenna remaining at rest when left in any position.

The "REMOTE BALANCE" parameter (located at the end of the Remote Parameters after REMOTE TILT) of the ACU. When enabled, Remote Balance Mode temporarily turns DishScan, Azimuth, Elevation and Cross-Level drive OFF. This function is required when trying to balance antenna systems that have a built-in brakes on the elevation and cross-level motors.

Assure that Antenna power is ON and that the antenna has completed initialization.

At the ACU:

1. From the ACU - REMOTE BALANCE parameter: Enable balance mode (refer to your ACU manual). The screen should now display "REMOTE BALANCE ON".

At the Antenna:

2. At the Antenna: Balance the antenna with the elevation near horizon (referred to as front to back balance) **by adding, or subtracting, small counter-weights**.
3. Then balance Cross Level axis (referred to as left-right balance) **by moving existing counter-weights from the left to the right or from the right to the left**. Always move weight from

one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of the reflector mounting frame to the top right of the reflector mounting frame). Do NOT add counter-weight during this step.

4. Last, balance the antenna with the elevation pointed at, or near, zenith (referred to as top to bottom balance) **by moving existing counter-weights from the top to the bottom or from the bottom to the top**. Always move weight from one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of the reflector mounting frame to the bottom left of the reflector mounting frame). Do NOT add counter-weight during this step.
5. When completed, the antenna will stay at any position it is pointed in for at least 5 minutes (with no ship motion).
6. ***Do NOT cycle antenna power to re-Initialize the antenna***. Return to the ACU, which is still in REMOTE BALANCE mode, and press ENTER to exit Remote Balance Mode. When you exit Balance Mode the antenna will be re-initialized, which turns DishScan, Azimuth, Elevation and Cross-Level drive ON.

7.4.2. To Adjust Tilt:

Select the REMOTE TILT window on the ACU and;

1. While at the Remote Tilt window, press the **UP** arrow.
2. Set a bubble (or bulls-eye) level on top of the Level Cage assembly.
3. Press the number 5 to zero the tilt sensor bias. **NOTE:** If the level cage is not within 4 degrees of level fore/aft or left/right, replace the Level Cage assembly.
4. If the level cage is within 4 degrees, use the 2 and 8 key to adjust LV (fore/aft) until the level cage is level in this axis.
5. If the level cage is within 4 degrees, use the 4 and 6 key to adjust CL (left/right) until the level cage is level in this axis.
6. Once the level cage is level in both axes, wait for 30 seconds then press the **DOWN** arrow key and then press the **ENTER** key.
7. Press MODE (or ENTER) to step the menu to REMOTE PARAMETERS.
8. Press the **UP** arrow key and then press the **ENTER** key to save the settings in the PCU.

This save the new tilt bias settings in the PCU. Reset or re-initialize the antenna to verify that the Level cage is properly level with the new settings.

7.4.3. To Reset/Reinitialize the Antenna:

Select the REMOTE COMMAND window on the ACU and;

1. Key in .94 and then hit the ENTER key (note the decimal point) to access the utility commands. "^0000" should appear in the command window.
2. Key in 90 and then hit the ENTER key.

This resets the PCU on the antenna. The antenna will reinitialize with this command (Performs a similar function as a power reset of the antenna).

7.5. Pedestal Control Unit Configuration (xx97B & xx00)

The PCU is designed to be used with a variety of antenna pedestal configurations. The configuration information that is unique to each pedestal type is stored in a Non Volatile Random Access Memory (NVRAM) in the PCU enclosure. If the PCU is replaced or the NVRAM in the PCU should become corrupt, the PCU must be re-configured to operate with the pedestal it is installed on. The default configuration for the PCU is model xx97B. In this configuration the PCU will not drive any of the three torque motors to prevent damage to the unknown pedestal.

To configure the PCU, select the REMOTE COMMAND window on the DAC-2202. Refer to the table below to key in the appropriate value for you model antenna.

7.5.1. To configure the PCU;

1. Select the REMOTE COMMAND window on the ACU.
2. Refer to the table below to key in the appropriate value for you model antenna to enter in the next step. ***EXAMPLE:*** For a **9797B** Model Antenna is system type 0211.
3. Using the **LEFT/RIGHT** and **UP/DOWN** arrow keys set the Remote Command value to "**N0211**" and press **ENTER**. The display should now show "N0211".
4. Press **ENTER** several times to select ***REMOTE PARAMETERS***. Press **LEFT** arrow and then **ENTER** to save the system type in the PCU.
5. Press **RESET** and the displayed Remote Version Number should now display "**9797B** VER 2.0x".

7.5.2. MODEL CONFIGURATION NUMBERS

The following table shows the current mode configuration values for Series 97B pedestals with 97/07 VER 2.10 or greater PCU software.

MODEL	**Configuration Number**	
xx97B	**N 0000**	***Turns off all drive motors***
8897B	N 0205	
9497B	N 0206	
12097B	N 0207	
14400B	N 0208	
8797B	N 0209	
9697B	N 0210	
9797B	**N 0211**	
14600B	N 0212	
9597B	N 0213	

7.6. Antenna Stowing Procedure

	WARNING: Antenna Pedestal ***must be properly restrained (stowed)*** to prevent damage to wire rope isolators, isolator springs and/or antenna pedestal mechanism during underway conditions ***when power is removed from the antenna assembly.***

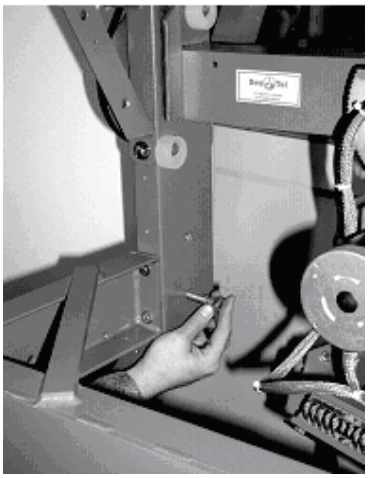
The normal operating condition for the Sea Tel Antenna system is to remain powered up at all times. This ensures that the antenna remains actively stabilized to prevent physical damage to the antenna pedestal and reduce condensation and moisture in the radome to prevent corrosion. If, for some reason, the antenna must be powered down during underway transits, it should be secured with nylon straps regardless of sea conditions to prevent damage to the antenna system. Refer to the procedure below to secure the antenna pedestal.

Equipment & Hardware needed:

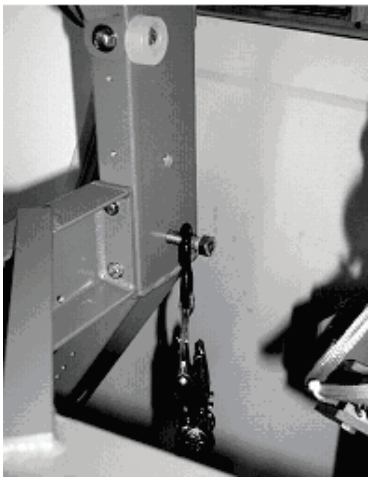
- Two (2) ½-13 x 2-inch Stainless Steel bolts.
- Two (2) Nylon straps with ratchet mechanism. ***Nylon straps must be rated to 300 lbs. Working load capacity and 900 lbs. Max rated capacity.***

Stowing procedure:

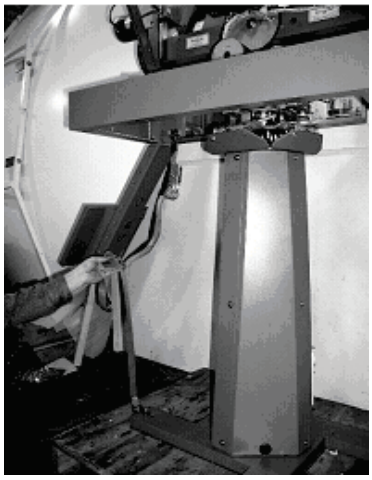
1. Point the antenna to Zenith, (90 degree elevation angle), straight up.
2. Install one (1) ½-13 x 2-inch bolt into the inside of each elevation beam as shown in Figure 1.



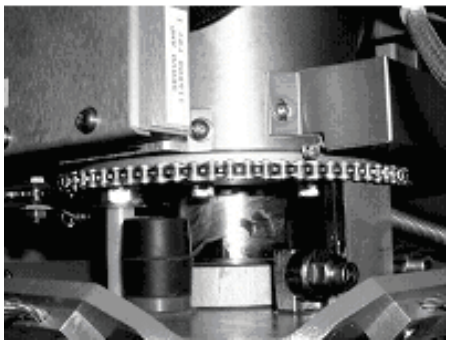
3. Hook one end hook of the nylon strap to bolt in elevation beam as shown in Figure 2.

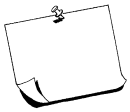


4. Hook the other end hook of the nylon strap to the pedestal-mounting frame as shown in Figure 3.



5. Use the ratchet of the strap to tighten nylon straps. As the straps are tightened, observe the vertical isolation canister assembly as shown in Figure 4.
6. Tighten straps until the canister has been pulled down approx. ¼ to ½ inch. Do not over-tighten. You must leave approximately 1/8 inch clearance between the rubber stops and the azimuth driven sprocket to allow the vertical vibration isolation to function properly.





NOTE: Remove both *the straps and the bolts* ***before applying power*** and returning the antenna to normal operating condition.

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8. 9797B-70 Technical Specifications

The technical specifications for your Series 97B Above Decks Equipment subsystems are listed below: Refer to your ACU manual for its' Specifications.

8.1. Antenna Reflector

Type	Honeycomb Fiberglass Parabola
Diameter (D)	2.4 Meter Modified Offset
Sidelobe:	Compliant with Intelsat Standard G
Voltage Axial Ratio:	1.3:1, maximum, Receive Band
	1.09:1, maximum, Transmit Band
Focal Length	38 in
f/D	0.245
RX Gain	38.5 dBi at 3.95 GHz
	47.75 dBi at 11.85 GHz
TX Gain	41.7 dBi at 6.18 GHz
	48.45 dBi at 14.25 GHz

8.2. Feed Assemblies

8.2.1. C-Band TXRX Feed Assembly

Type	Prime focus
Transmit frequency	5.9-6.4 GHz C Band
Receive frequency	3.7-4.2 GHz C Band
Polarization	Linear or Circular
VSWR :	1.3:1
Polang control	24 volt DC motor with position feedback for Linear Feed. None for Circular Feed
LNB/LNC Gain & Noise Figure	Refer to RF Equipment vendor manual(s)

8.3. RF Equipment

C-Band Block Up-Converter	Codan model 67xx, 25 Watt (optional 40W) C-Band MBUC, Standard or Extended band with waveguide output
C-Band LNB	Norsat model 3000 C-Band PLL LNB
Noise Temperature	20K to 30K
Gain	55dB min to 70 dB max
Input Frequency Range	3.40-4.20 GHz
Local Oscillator Frequency	5.15 GHz (stability +/- 5kHz to +/- 25kHz depending on model)
Output Frequency Range	950-1750 MHz

8.4. Norsat 3000 Series C-Band LNB

Noise temperature maximum	15K to 35K
L.O. stability maximum	±5 kHz to ±25 kHz
Phase noise	-73 dBc/Hz at 1 kHz, -83 dBc/Hz at 10 kHz, -93 dBc/Hz at 100 kHz
Conversion gain	55 dB min, 70 dB max
Power requirements	+15 to +24 V supplied through center conductor of IF cable
Input frequency (GHz)	3.40 to 4.20 GHz
L.O. frequency (GHz)	5.15 GHz

Output frequency (MHz)	950 to 1750 MHz

8.5. Pedestal Control Unit (PCU)

The PCU Assembly contains 1 Printed Circuit Board (PCB). It is the main control board.

Connectors		
	Antenna Pedestal	44 Pin D-Sub connector
	M&C Interface	15 Pin D-Sub connector
	GPS Input	BNC connector
Controls		None
M&C Interface		9600 Baud RS-422

8.6. 144" Radome Assembly

Type	Rigid dome
Material	Composite foam/fiberglass
Size	144" Diameter x 142" High
Base Hatch size	18" high x 34" wide
Side Door	18" wide x 36" high
Number of panels	Twelve panels (6 upper & 6 lower panels), one top cap and one base pan
Installed height:	164" including base frame if mounted with standard Legs, 148" if Flush-mounted
Installed weight	***MAX*** 1800 LBS (including Antenna Pedestal Assembly)
RF attenuation	1.5 dB @ 6 GHz, dry
	1.5 dB @ 12 GHz, dry
	1.5 dB @ 14 GHz, dry
Wind:	Withstand relative average winds up to 100 MPH from any direction.
Ingress Protection Rating	All Sea Tel radomes have an IP rating of 56

NOTE: Radome panels can absorb up to 50% moisture by weight. Soaked panels will also have higher attenuation.

8.7. Unlimited Azimuth Modems (3 Channel)

Combined Signals		950-3000 MHz Ku-Band RX IF (less if not stacked), 3.7-4.2 GHz C-Band RX RF, 1.1/1.5, or 0.7/1.9, MHz FSK Pedestal M&C
Connectors:		
	TX / RX IF	SMA Connector
	Rotary Joint	SMA Connector
	TVRO option	Type F
	DC / Ped M&C	9 pin D-Sub Connector

8.8. Stabilized Antenna Pedestal Assembly

Type:	Three-axis (Level, Cross Level and Azimuth)
Stabilization:	Torque Mode Servo
Stab Accuracy:	0.2 degrees MAX, 0.1 degrees RMS in presence of specified ship motions (see below).
LV, CL, AZ motors:	Size 34 Brushless DC Servo.
Inertial Reference:	Solid State Rate Sensors
Gravity Reference:	Two Axis Fluid Tilt Sensor
AZ transducer:	256 line optical encoder / home switch
Range of Motion:	
Elevation	-15 to +100 degrees
Cross Level	+/- 25 degrees
Azimuth	Unlimited
Elevation Pointing:	+0 to +85 degrees (with 15 degree Roll)
	+5 to +80 degrees (with 20 degree Roll)
	+10 to +75 degrees (with 25 degree Roll)
Relative Azimuth Pointing	Unlimited
Specified Ship Motions (for stabilization accuracy tests):	
Roll:	+/-15 degrees at 8-12 sec periods
Pitch:	+/-10 degrees at 6-12 sec periods
Yaw:	+/-8 degrees at 15 to 20 sec periods
Turning rate:	Up to 12 deg/sec and 15 deg/sec/sec
Headway:	Up to 50 knots
Mounting height:	Up to 150 feet.
Heave	0.5G
Surge	0.2G
Sway	0.2G
Maximum ship motion:	
Roll	+/- 25 degrees (Roll only)
	+/- 20 degrees (combined with Pitch)
Pitch	+/- 15 degrees
Yaw Rate	12 deg/sec, 15 deg/sec/sec

8.9. Environmental Conditions (ADE)

Temperature:	-20 degrees C to 55 degrees C.
Humidity:	Up to l00% @ 40 degrees C, Non-condensing.
Spray:	Resistant to water penetration sprayed from any direction.
Icing:	Survive ice loads of 4.5 pounds per square foot. Degraded RF performance will occur under icing conditions.
Rain:	Up to 4 inches per hour. Degraded RF performance may occur when the radome surface is wet.
Wind:	Withstand relative average winds up to 100 MPH from any direction.
Vibration:	Withstand externally imposed vibrations in all 3 axes, having displacement amplitudes as follows:
Frequency Range, Hz	Peak Single Amplitude
4 - 10	0.100 inches (0.1G to 1.0G)
10 - 15	0.030 inches (0.3G to 0.7G)
15 - 25	0.016 inches (0.4G to 1.0G)
25 - 33	0.009 inches (0.6G to 1.0G)
Corrosion	Parts are corrosion resistant or are treated to endure effects of salt air and salt spray. The equipment is specifically designed and manufactured for marine use.

8.10. Cables

8.10.1. Antenna Control Cable (Provided from ACU-MUX)

RS-422 Pedestal Interface

Type	Shielded Twisted Pairs
Number of wires	
Wire Gauge	24 AWG or larger
Communications Parameters:	9600 Baud, 8 bits, No parity
Interface Protocol:	RS-422
Interface Connector:	DE-9P

8.10.2. Antenna Transmit & Receive IF Coax Cables (Customer Furnished)

Due to the dB losses across the length of the RF coaxes at L-Band, Sea Tel recommends the following 50 ohm coax cable types (and their equivalent conductor size) for our standard pedestal installations:

Run Length	Coax Type	Conductor Size
up to 35 ft	RG-58	20 AWG
up to 75 ft	RG-8 or LMR-300	18 AWG
up to 150 ft	RG-213, RG214 or LMR-400	14 AWG
up to 200 ft	LDF4-50 Heliax or LMR-500	10 AWG
Up to 300 ft	LMR-600	6 AWG

For runs longer that 300 feet, Sea Tel recommends Single-mode Fiber Optic Cables with Fiber Optic converters.

8.10.3. Multi-conductor Cables (Customer Furnished)

Due to the voltage losses across the multi-conductor cables, Sea Tel recommends the following wire gauge for the AC & DC multi-conductor cables used in our standard pedestal installations:

Run Length	Conductor Size
up to 50 ft	20 AWG (0.8 mm)
up to 100 ft	18 AWG (1.0 mm)
up to 150 ft	16 AWG (1.3 mm)
up to 250 ft	14 AWG (1.6 mm)
Up to 350 ft	12 AWG (2.0 mm)

8.10.4. AC Power Cable (Pedestal & Rf Equipment)

Voltage:	110 or 220 volts AC (220 VAC Recommended)
Pedestal Power:	100 VA ***MAX***
RF Equipment Power:	1500 VA ***MAX***

8.10.5. AC Power Cable (Optional Marine Air Conditioner)

Voltage:	220 volts AC
Breaker Required	20 Amp
Full Load Amperage:	5.4 Amps

8.10.6. Gyro Compass Interface Cable (Customer Furnished)

Type:	Multi-conductor, Shielded
Number of wires	4 Conductors for Step-By-Step Gyro, 5 Conductors for Synchro
Wire Gauge:	see Multi-conductor Cables spec above
Insulation:	600 VAC

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9. Drawings

The drawings listed below are provided as apart of this manual for use as a diagnostic reference. Spare Parts kits listings are provided as part number reference for replaceable parts and common assemblies.

9.1. 9797B-70 Model Specific Drawings

Drawing	Title	
128406-101_A	**System, Model 9797B-70, Linear, A/C**	**9-3**
128409-1_A	**System Block Diagram – Model 9797B-70**	**9-5**
128407-1_A	**General Assembly – Model 9797B-70**	**9-8**
128410_A	**Antenna System Schematic – Model 9797B-70**	**9-10**
127991-1_A	**Antenna Assembly, 2.4M Offset**	**9-11**
128423-1_A	**TX Wavegiude run**	**9-14**
123285-4_B1	**Tx/Rx Feed Sub-Assembly, C-Band, Linear, DishScan**	**9-17**
111365-17_N1	**Radome Ass'y, 144 Inch**	**9-19**
123723-9_B1	**Radome Base Ass'y, 75 In. STL**	**9-21**
123496-1_C1	**Air Conditioner, Internal**	**9-23**
122508_E	**AC Install Assy, Internal**	**9-24**
123908_B1	**Installation Arrangement**	**9-26**

9.2. Series 97 General Drawings

Drawing	Title	
128878-1_A	**Spare Parts Kit, XX97B / XX00B, Standard**	**9-28**
1288787-1_A	**Spare Parts Kit, XX97B / XX00B, Premium**	**9-29**
128878-3_A	**Spare Parts Kit, XX97B / XX00B,Master**	**9-30**
126374_A	**Pedestal Harness Schematic**	**9-31**
121628-4_N2	**Terminal Mounting Strip**	**9-32**
116881-16_C	**Base Modem Rack Panel Ass'y**	**9-34**

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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128407-1	A	GENERAL ASS'Y, 9797B-70	
2	1 EA	111365-17	N1	RADOME ASS'Y, 144 INCH, WHITE/SIDE AC	
3	1 EA	123723-1	B1	RADOME BASE ASS'Y, 75 IN., STL, NO AC	
5	0 EA	124571-X		(REF ONLY) SSPB, C-BAND, MBUC, CODAN	
6	0 EA	124556-X		(REF ONLY) LNB, C-BAND PLL, NORSAT 30	
7	1 EA	123285-4	C	9797B FEED SUB-ASS'Y, C-BAND, LIN., D	
15	1 EA	125411-3	H	DAC-2202, SCPC RCVR, 9 WIRE IF	(NOT SHOWN)
16	1 EA	123752-5	D	BELOW DECK KIT, L-BAND, PED & RF M&C	(NOT SHOWN)
17	1 EA	128188-10		CUSTOMER DOC PACKET, 9797B-70, TX/RX	(NOT SHOWN)
26	1 EA	122539-1	B	SHIP STOWAGE KIT, XX97	(NOT SHOWN)
27	1 EA	114569	D	BALANCE WEIGHT KIT	(NOT SHOWN)
28	1 EA	124877-1	C	DECAL KIT, XX97, SEATEL (126 IN/144 I	(NOT SHOWN)

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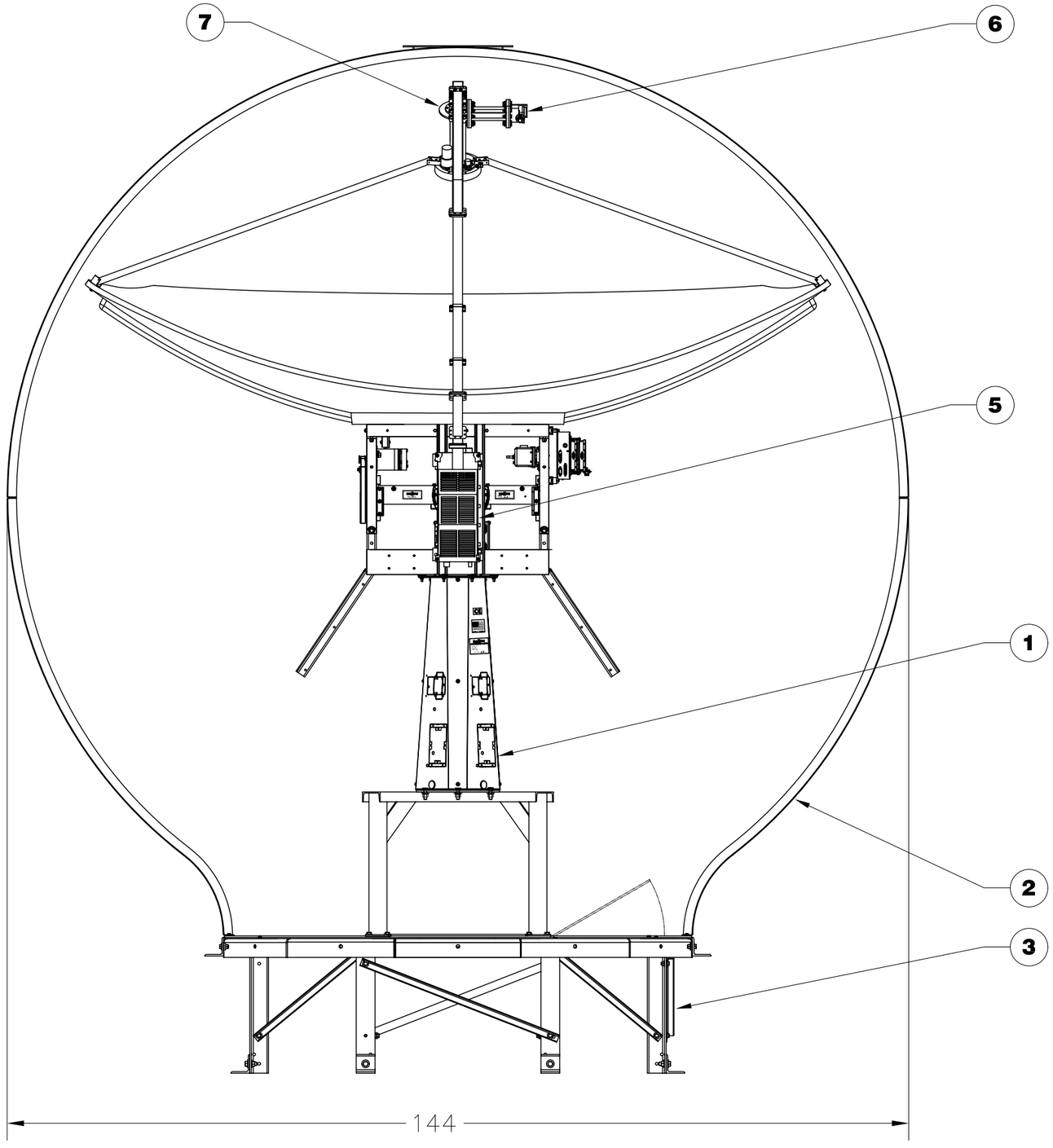
SYSTEM, 9797B-70, LIN, 25-40W

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
97 TX/RX	4/28/2009	1 OF 1	128406-101	A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6586	3-13-09	DASH 4, 5, 6, 8, 10 & 11 ITEM 7 WAS 123285-3; RELEASED TO PRODUCTION, WAS X3	K.D.H.



DASH #	BAND	POL	WATT	RF MFR:	LNB #	OTHER (AC-DOME)
-1	C	CIR	40W	CODAN MBUC	3130F	
-2	C	CIR	40W	CODAN MBUC	3130F	WITH AC
-3	C	CIR	25W	CODAN MBUC	3130F	
-4	C	LIN	40W	CODAN MBUC	3130F	
-5	C	LIN	40W	CODAN MBUC	3130F	WITH AC
-6	C	LIN	25W	CODAN MBUC	3130F	
-7	C	CIR	60W	CODAN MBUC	3130F	WITH AC
-8	C	LIN	60W	CODAN MBUC	3130F	WITH AC
-9	C	CIR	40W	CODAN MBUC	3120F	AC-RDY, CFE
-10	C	LIN	40W	CODAN MBUC	3120F	AC-RDY, CFE
-11	C	LIN	25W	CODAN MBUC	3220F	WITH 110V AC

REFERENCE DRAWINGS:

128409 SYSTEM BLOCK DIAGRAM
126374 PEDESTAL SCHEMATIC
128410 ANTENNA SYSTEM SCHEMATIC
121910 SHIPYARD SPEC.

NOTES: UNLESS OTHERWISE SPECIFIED

1. APPLY ADHESIVE PER SEATEL SPEC. 121730.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M - 1994

MATERIAL: SEE BOM

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: SMS
DRAWN DATE: 6-24-08
APPROVED BY:
APPROVED DATE:

Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: **SYSTEM, 9797B-70**

SIZE: B | SCALE: NONE | DRAWING NUMBER: 128406 | REV: A

FIRST USED: 9797B-70 | SHEET NUMBER: 1 OF 1

DOCUMENT NO. 124225-4_A

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128407-1	A	GENERAL ASS'Y, 9797B-70	
2	1 EA	111365-17	N1	RADOME ASS'Y, 144 INCH, WHITE/SIDE AC	
4	1 EA	123351-4	C	9797B FEED SUB-ASS'Y, C-BAND, CIRC.,	
5	1 EA	124571-X		(REF ONLY) SSPB, C-BAND, MBUC, CODAN	
6	1 EA	124556-X		(REF ONLY) LNB, C-BAND PLL, NORSAT 30	
18	1 EA	117168-6	P	MODEM ASS'Y, PEDESTAL, 3 CH, 75 OHM,	
19	1 EA	117611-3	H	MODEM ASS'Y, PEDESTAL, 3 CH, 50 OHM	
21	1 EA	115708-3	H3	CIRCUIT BREAKER BOX ASS'Y, 97 220V	
22	1 EA	125570-4	E1	POWER SUPPLY ASS'Y, COSEL 150W, RH EN	
23	1 EA	127513-1	B	PCU ASS'Y, XX97B, STD	
24	1 EA	116024-3	K	SHIELDED POLANG RELAY ASS'Y	
25	3 EA	116000-1	J1	SERVO AMPLIFIER ASS'Y	
26	1 EA	122208-1	L	LEVEL CAGE ASS'Y, SIDE EXIT, 080 P.,	
27	1 EA	121966-6	D1	GPS ANTENNA, RETERMINATED, 32.0 L	
28	1 EA	116034	F	HOME SWITCH ASS'Y, SHIELDED	
30	1 EA	127892-2	A	INTERFACE HARNESS ASS'Y	
31	1 EA	126375-3	A	HARNESS ASS'Y, PEDESTAL	
32	1 EA	121485-4	F	HARNESS ASS'Y, REFLECTOR	
33	1 EA	125726-3	B	HARNESS ASS'Y, BRAKE, 56 IN, XX07	
34	1 EA	128131-72	A	CABLE ASSY, M&C, RS-232 TO CODAN SSPB	
40	1 EA	121250-2	C3	POWER RING ASS'Y, 22 IN, 96 IN. CONTA	
41	1 EA	124287-56	D	CABLE ASS'Y, PEDESTAL AC POWER	
42	1 EA	124288-36	F	CABLE ASS'Y, AC POWER, 36 IN	
43	1 EA	128170-48	A	CABLE ASSY, AC PWR. TO CODAN MBUC, 48	
50	1 EA	122583-12	A	CABLE ASS'Y, RG-6, F(M) TO F(M), 12FT	
51	1 EA	114973-96	D	CABLE ASS'Y, COAX, TYPE N, 96 IN.	
52	1 EA	114972-9	L	CABLE ASS'Y, SMA(M) - SMA(M), 6 IN	
53	1 EA	113303-5	S	CABLE ASS'Y, SMA 90 - SMA (M), 84 IN	

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SYSTEM BLOCK DIAGRAM, 9797B-70, LIN C-BAND, 25 TO 40 WATT

PROD FAMILY LIT	EFF. DATE 4/28/2009	SHT 1 OF 3	DRAWING NUMBER 128409-1	REV A

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
54	1 EA	121281	A	CABLE ASS'Y, SMA(F)-SMA(M), 3 IN.	
55	1 EA	114972-2	L	CABLE ASS'Y, SMA(M) - SMA(M), 72 IN	
60	3 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
61	1 EA	116466	C1	ROTARY JOINT, 4.5 GHz, DUAL COAX.	
70	1 EA	117696-2	A	WAVEGUIDE, WR-229, 90 DEG E-BEND	
71	1 EA	129948-1	A2	C BAND RADAR TRANSMIT REJECT FILTER	
72	1 EA	129950	A	WAVEGUIDE, WR-229, 180 DEG, H BEND	
80	1 EA	128424-1	A	WAVEGUIDE, WR-137, RIGID, 9797	
81	1 EA	128425-1	A	WAVEGUIDE, WR-137, 90 DEG E-BEND /W F	
82	1 EA	112991-2	E1	WAVEGUIDE, WR-137, FLEXGUIDE, 24 IN	
83	1 EA	115509	D	WAVEGUIDE, WR-137, ROTARY JOINT, L-ST	
100	1 EA	125411-3	H	DAC-2202, SCPC RCVR, 9 WIRE IF	
101	1 EA	123752-5	D	BELOW DECK KIT, L-BAND, PED & RF M&C	
102	1 EA	116881-18	C	MUX RACK PANEL ASS'Y, RX SS, SF, SPLI	
103	1 EA	121628-4	P	TERMINAL MOUNTING STRIP ASS'Y, ACU	
104	1 EA	117168-2	P	MODEM ASS'Y, BASE, 3 CH, 75 OHM	
105	1 EA	117611-4	H	MODEM ASS'Y, BASE, 3 CH, 50 OHM	
106	1 EA	116298-6	F5	INTERFACE HARNESS ASS'Y, ACU TO MODEM	
107	1 EA	120643-25	A	CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT,	
108	1 EA	119479-10	B	CABLE ASS'Y, CAT5 JUMPER, 10 FT.	
109	1 EA	124095-36	E	CABLE ASS'Y, RJ45 SERIAL, IDIRECT	(NOT SHOWN)
111	1 EA	113303-10	S	CABLE ASS'Y, SMA 90 - SMA (M), 8 IN	
112	1 EA	114972-9	L	CABLE ASS'Y, SMA(M) - SMA(M), 6 IN	
113	2 EA	111115-3	B	CABLE ASS'Y, F(M)-F(M), 3 FT.	
114	1 EA	116700-6	F	CABLE ASS'Y, RG223, N(M)-F(M), 6 FT.	
120	1 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
121	1 EA	110567-19		ADAPTER, N(F)-N(F), STRAIGHT, FLANGE	

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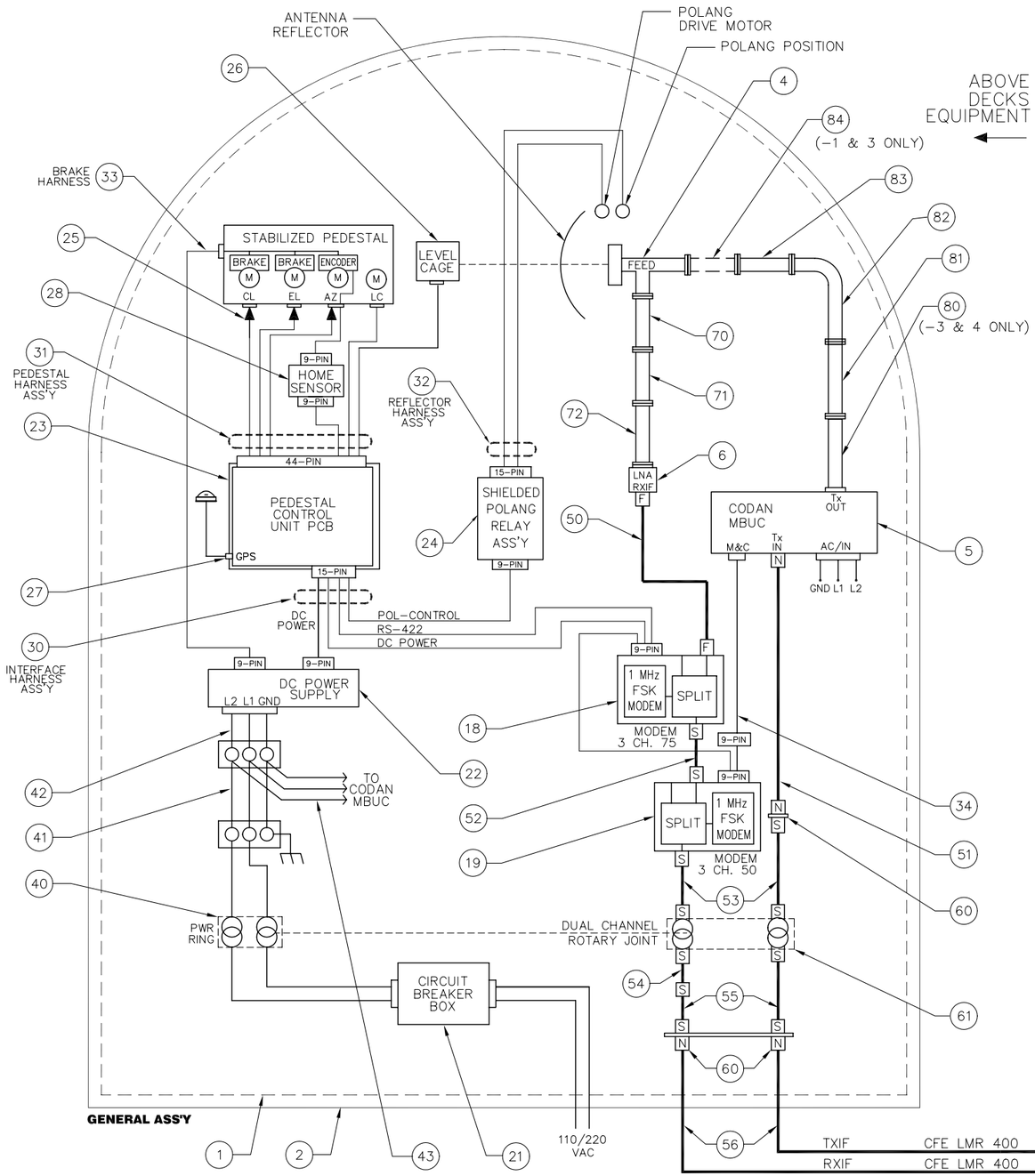
SYSTEM BLOCK DIAGRAM, 9797B-70, LIN C-BAND, 25 TO 40 WATT

PROD FAMILY LIT	EFF. DATE 4/28/2009	SHT 2 OF 3	DRAWING NUMBER 128409-1	REV A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6586	3–13–09	RELEASED TO PRODUCTION, WAS X1.	K.D.H.



DASH #	DESCRIPTION
−1	LINEAR C–BAND, 25 TO 40 WATT
−2	CIRCULAR C–BAND, 25 TO 40 WATT
−3	LINEAR C–BAND, 60 WATT
−4	CIRCULAR C–BAND, 60 WATT

REFERENCE DRAWINGS
128410 ANTENNA SYSTEM SCHEMATIC
126374 ANTENNA PEDESTAL SCHEMATIC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M – 1994

MATERIAL: SEE BOM

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: SMS
DRAWN DATE: 7–2–08
APPROVED BY:
APPROVED DATE:

SIZE: B
SCALE: NONE

Sea Tel
COBHAM
Tel. 925–798–7979 Fax. 925–798–7986

TITLE: SYSTEM BLOCK DIAGRAM 9797B–70

DRAWING NUMBER: 128409
REV: A

FIRST USED: 9797B–70
SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

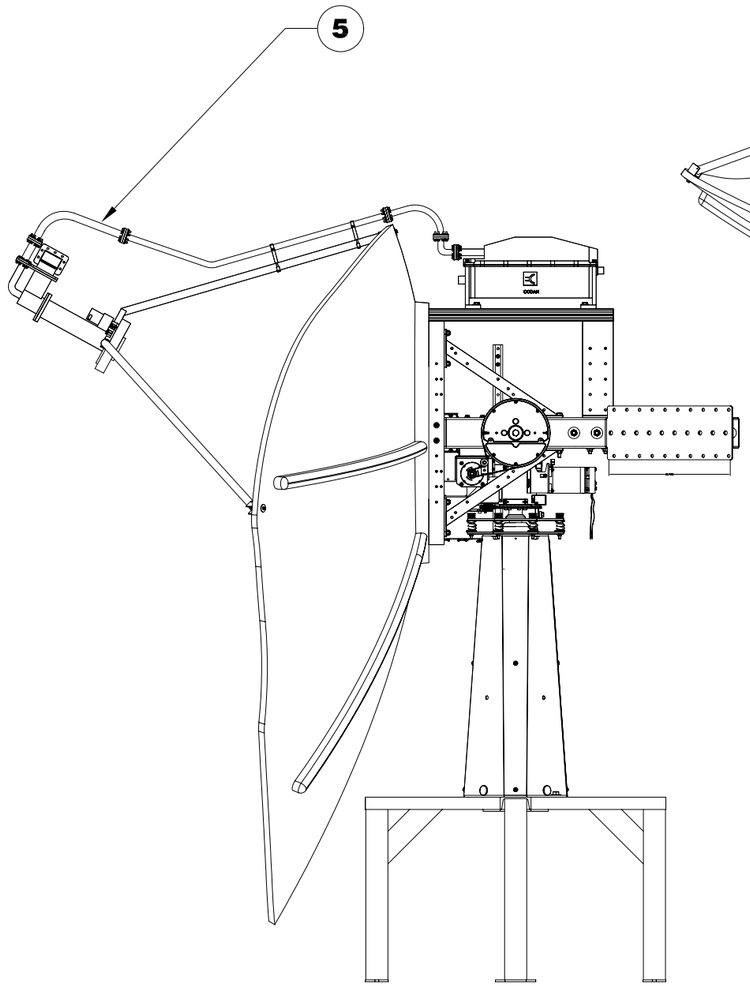
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128144-1	A1	PEDESTAL ASS'Y, XX07	
2	1 EA	129195-1	A	POWER ASS'Y, 220V, 34 IN. SHROUD, TX/	
3	1 EA	128408-1	A	ELECT. EQ. FRAME ASS'Y, 9797B-70, COD	
4	1 EA	127991-1	C1	ANTENNA ASS'Y, 2.4M OFFSET, 9797B	
5	1 EA	128423-1	A	WAVEGUIDE RUN ASS'Y, 9797B-70, 40 WAT	
11	1 EA	121655-1	D	LABELS INSTALLATION	
12	1 EA	123530-2	D	GROUND BONDING KIT, XX97	(NOT SHOWN)
20	1 EA	121485-4	F	HARNESS ASS'Y, REFLECTOR	(NOT SHOWN)
21	1 EA	122583-12	A	CABLE ASS'Y, RG-6, F(M) TO F(M), 12FT	(NOT SHOWN)
22	1 EA	114973-72	D	CABLE ASS'Y, N(M)-N(M), 72 IN.	(NOT SHOWN)
23	1 EA	128131-72	A	CABLE ASSY, M&C, RS-232 TO CODAN SSPB	(NOT SHOWN)
24	1 EA	128195-48	B	CABLE ASS'Y, AC PWR TO CODAN PSU	(NOT SHOWN)

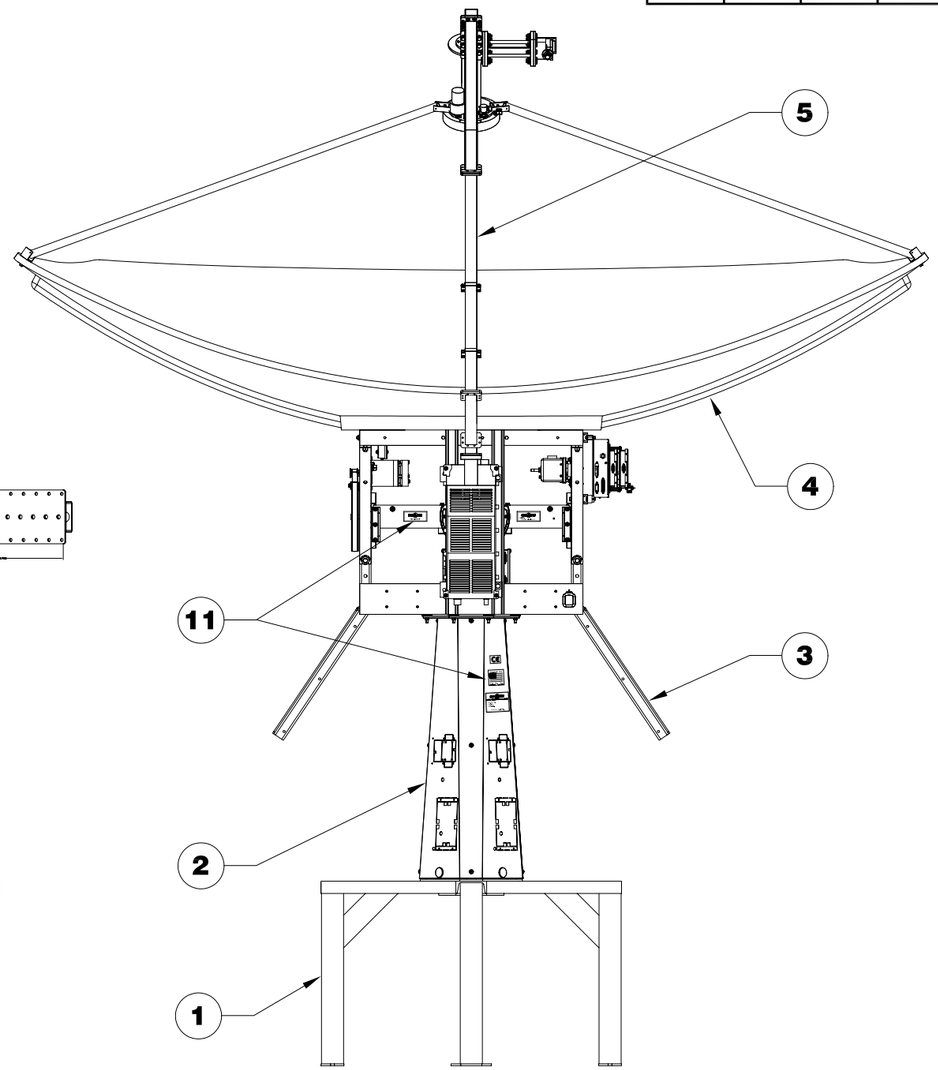
Sea Tel
COBHAM

GENERAL ASS'Y, 9797B-70

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
97 TX/RX	4/28/2009	1 OF 1	128407-1	A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6586	3-13-09	RELEASED TO PRODUCTION, WAS X2	K.D.H.





DASH	DESCRIPTION
-1	MODEL 9797B-70
-2	MODEL 9797B-70, 60 WATT

NOTES: UNLESS OTHERWISE SPECIFIED

1. APPLY ADHESIVE PER SEATEL SPEC 121730.

REFERENCE DRAWINGS:

128409 SYSTEM BLOCK DIAGRAM.
126374 PEDESTAL SYSTEM SCHEMATIC
128410 ANTENNA SYSTEM SCHEMATIC.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M - 1994

MATERIAL: SEE BOM

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: SMS

DRAWN DATE: 6-24-08

APPROVED BY:

APPROVED DATE:

Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

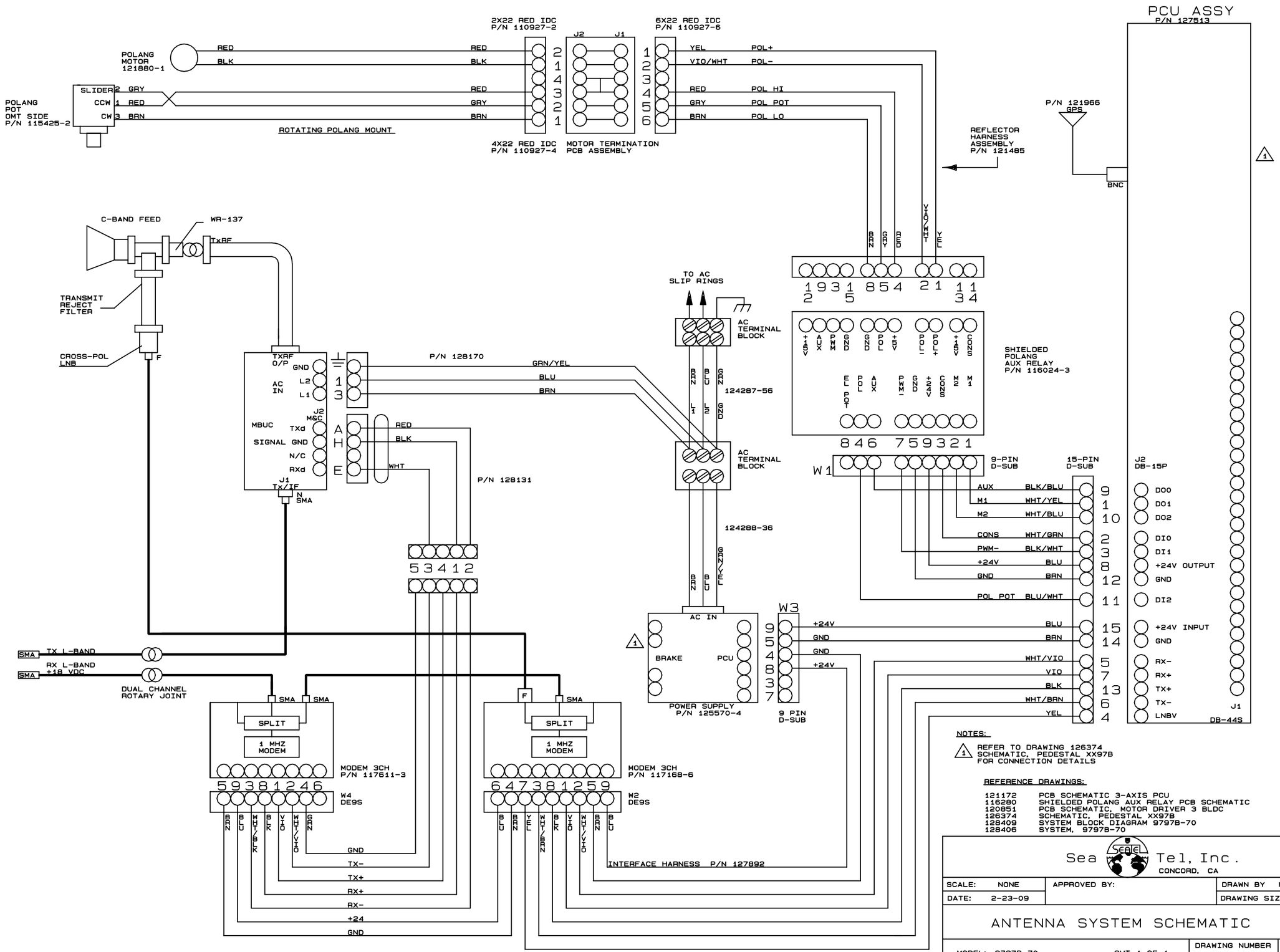
TITLE:
GENERAL ASSEMBLY
9797B-70

SIZE: B | SCALE: NONE | DRAWING NUMBER: 128407 | REV: A

FIRST USED: 9797B-70 | SHEET NUMBER: 1 OF 1

DOCUMENT NO. 124225-4_A

REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	11-12-08	NEW DRAWING	MSF



NOTES:

1. REFER TO DRAWING 126374 SCHEMATIC, PEDESTAL XX97B FOR CONNECTION DETAILS

REFERENCE DRAWINGS:

121172	PCB SCHEMATIC 3-AXIS PCU
116280	SHIELDED POLANG AUX RELAY PCB SCHEMATIC
120851	PCB SCHEMATIC, MOTOR DRIVER 3 BLDC
126374	SCHEMATIC, PEDESTAL XX97B
128409	SYSTEM BLOCK DIAGRAM 9797B-70
128406	SYSTEM, 9797B-70

Sea Tel, Inc.
CONCORD, CA

SCALE: NONE	APPROVED BY:	DRAWN BY MSF	
DATE: 2-23-09		DRAWING SIZE: C	

ANTENNA SYSTEM SCHEMATIC

MODEL: 9797B-70	SHT 1 OF 1	DRAWING NUMBER 128410	REV. A

SINGLE LEVEL MFG BILL OF MATERIAL

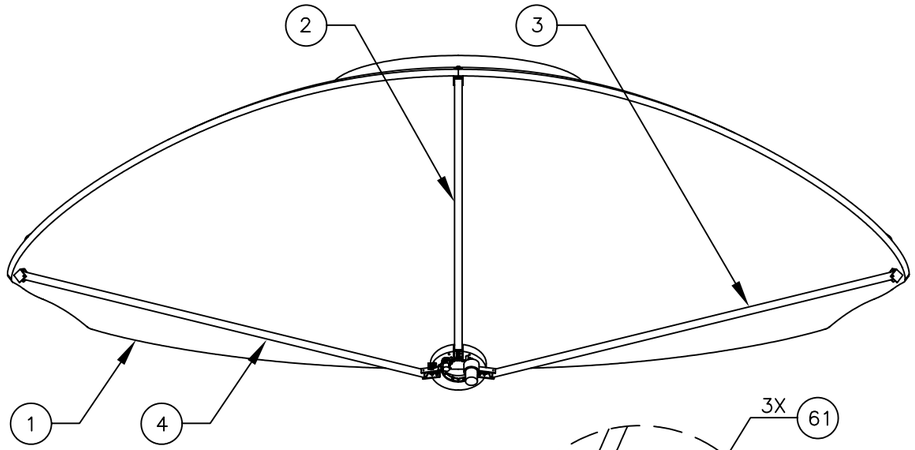
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	116803	C	REFLECTOR, OFFSET, 2.4M	
2	1 EA	120292	D1	FEED STRUT, TOP	
3	1 EA	120293	A1	FEED STRUT, LEFT	
4	1 EA	120294	A1	FEED STRUT, RIGHT	
5	1 EA	123208	D	SCALAR PLATE ASS'Y, DISHSCAN	
6	1 EA	128430-1		HARDWARE KIT, INSTALL OFFSET ANTEN	
7	1 EA	118294-6	A3	HARDWARE KIT, WR-75 FLANGE, M4	
8	1 EA	118294-4	A3	HARDWARE KIT, WR-229 FLANGE	
50	8 EA	114593-160		SCREW, SOCKET HD, 10-32 x 1/4, S.S.	
51	8 EA	114580-011		WASHER, FLAT, #10, S.S.	
60	3 EA	114586-540		SCREW, HEX HD, 1/4-20 x 1-1/4, S.S.	
61	3 EA	114625-108		WASHER, FENDER, 1/4 IN, 18-8 S.S. (1-1/4	
62	8 EA	114580-029		WASHER, FLAT, 1/4, S.S.	
63	6 EA	114583-029		NUT, HEX, 1/4-20, S.S.	
64	2 EA	114586-537		SCREW, HEX HD, 1/4-20 x 3/4, S.S.	
65	2 EA	114581-029		WASHER, LOCK, 1/4, S.S	

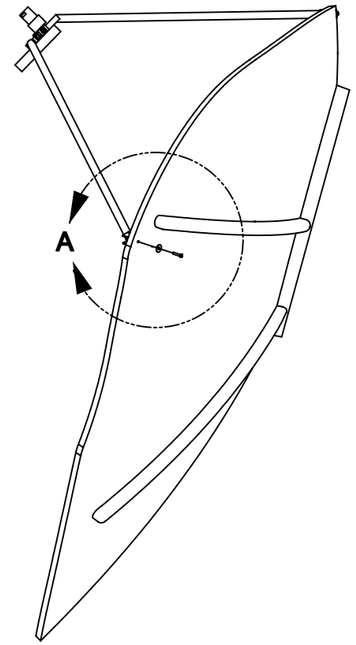
Sea Tel

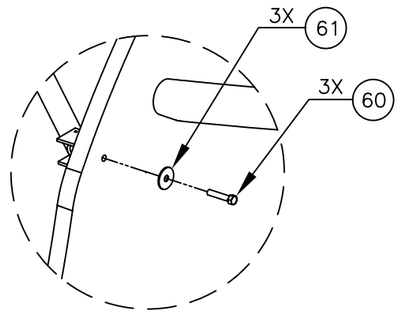
ANTENNA ASS'Y, 2.4M OFFSET, 9797B-76

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	04-Sep-08	1 OF 1	**127991-1**	**A**

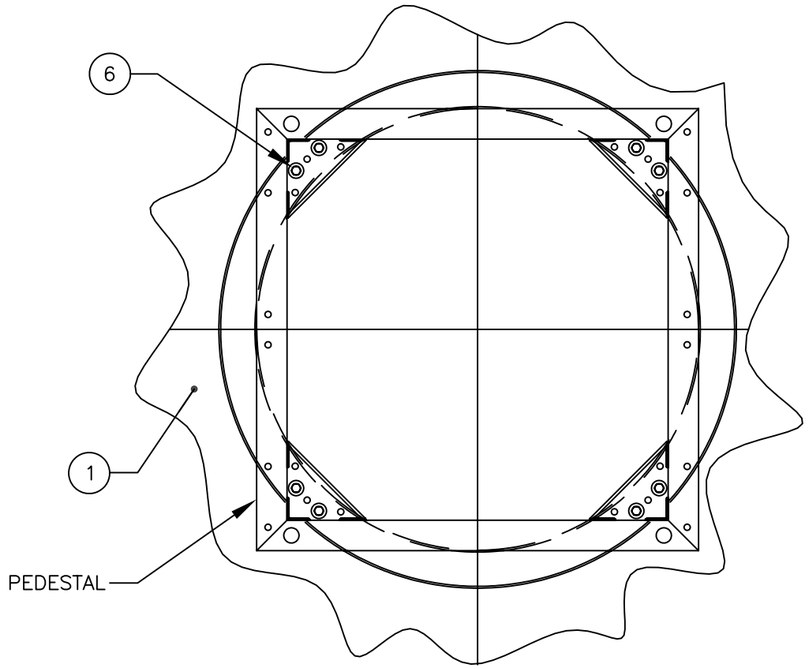
REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	6-2-08	UPDATED BOM TO CURRENT CONFIGURATION; ADDED FEED CONFIGURATIONS, PAGE 2.	SMS



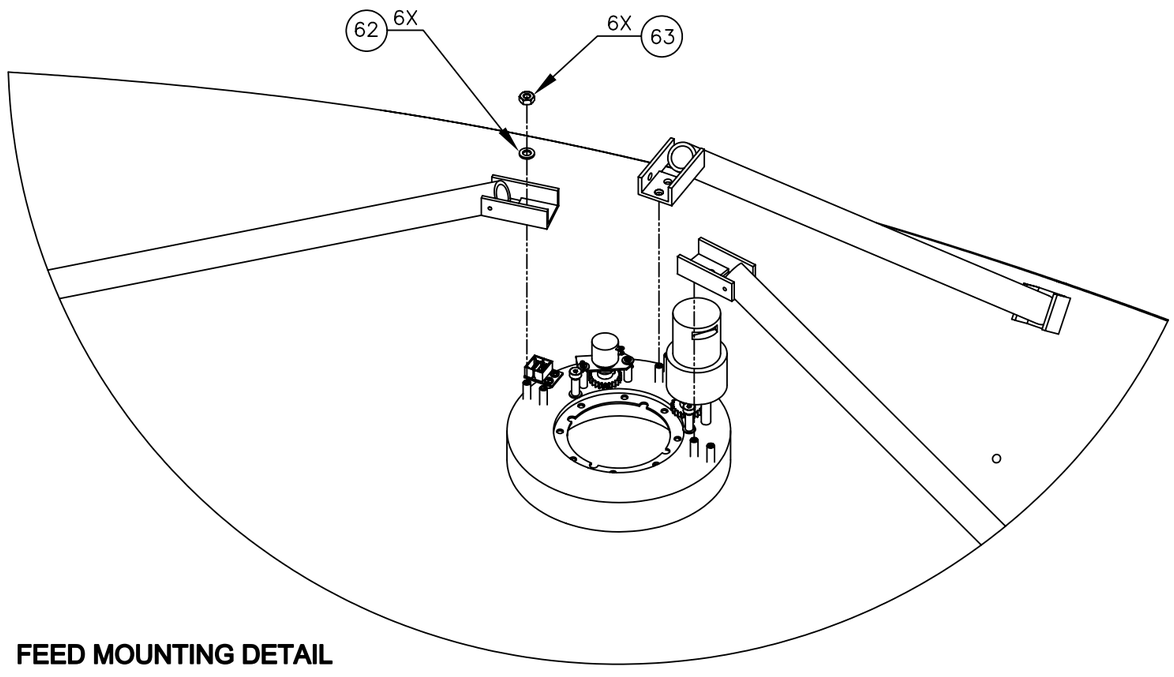




DETAIL A



REFLECTOR MOUNTING DETAIL



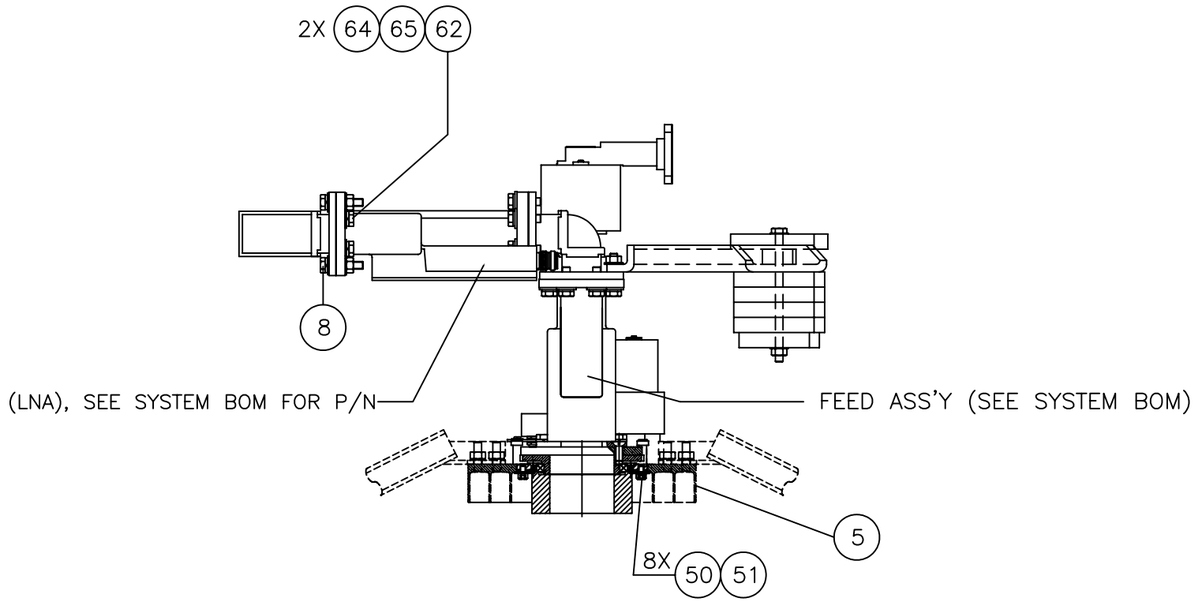
FEED MOUNTING DETAIL

NOTES: UNLESS OTHERWISE SPECIFIED

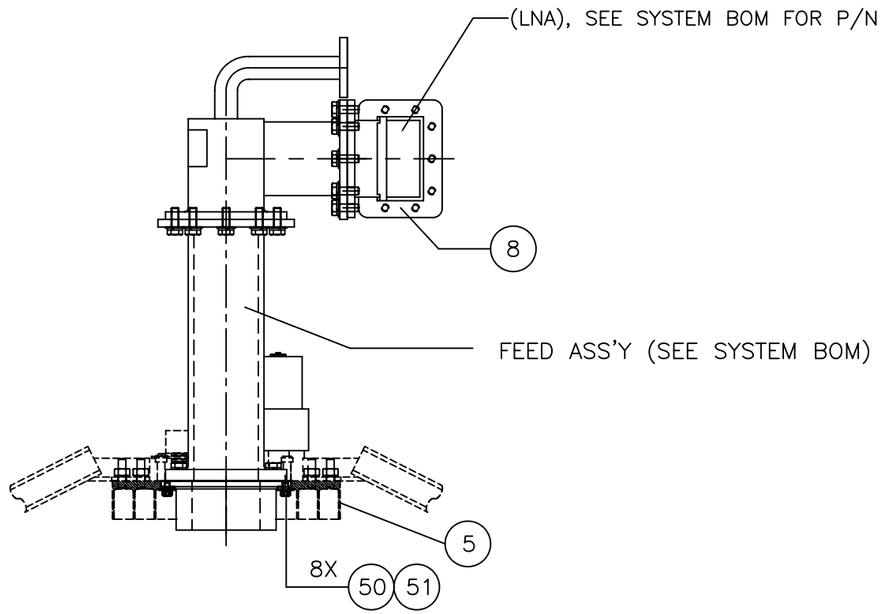
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.
3. MOUNT TOP STRUT USING HOLE NEAREST TO OUTER EDGE OF REFLECTOR.

TOLERANCES UNLESS OTHERWISE SPECIFIED X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M – 1994	DRAWN BY: SMS DRAWN DATE: 4-7-08 APPROVED BY: APPROVED DATE:	Sea Tel® 4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986
MATERIAL: N/A		TITLE: ANTENNA ASS'Y, 2.4M OFFSET
FINISH: N/A	SIZE: B SCALE: NONE	DRAWING NUMBER: 127991 REV: A
3rd ANGLE PROJECTION	FIRST USED: 9797B-76	SHEET NUMBER: 1 OF 2

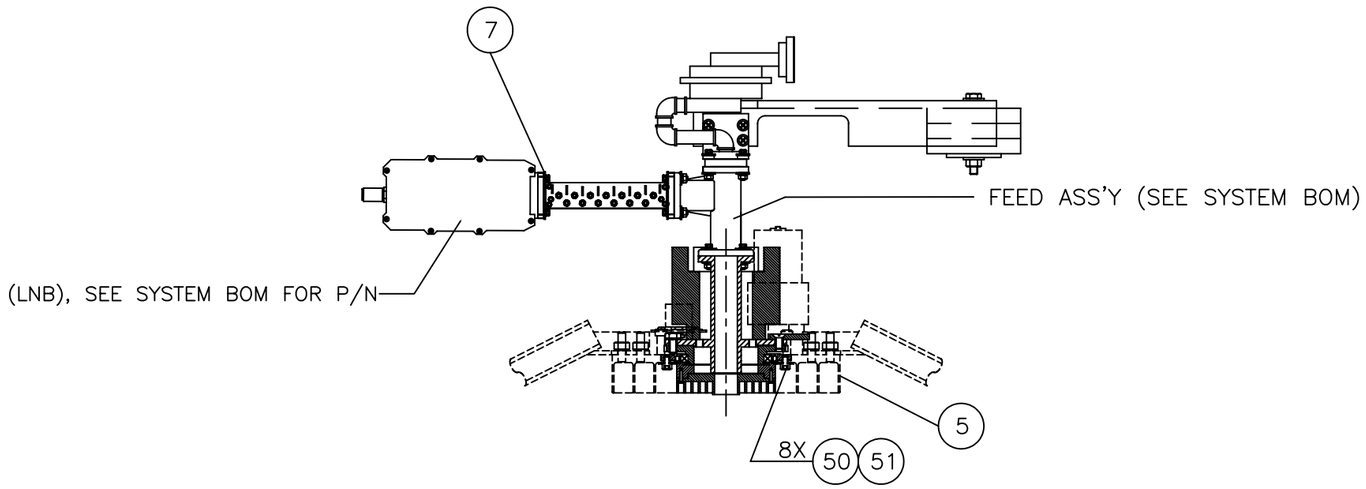
DOCUMENT NO. 124225-4_A



LINEAR C–BAND CONFIGURATION



CIRCULAR C–BAND CONFIGURATION



LINEAR Ku–BAND CONFIGURATION

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	127991	A
		SHEET NUMBER:	2 OF 2

DOCUMENT NO. 124225-4_A

SINGLE LEVEL MFG BILL OF MATERIAL

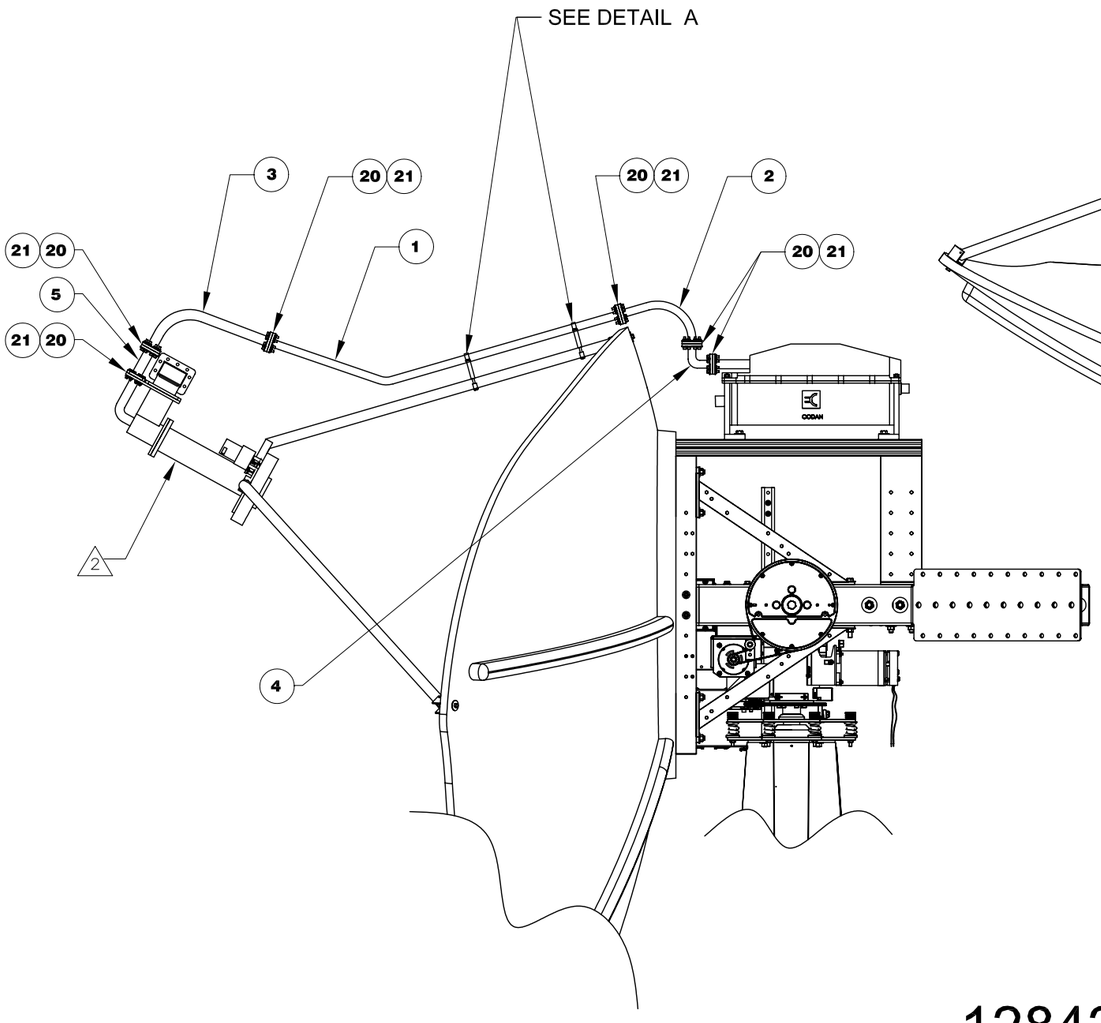
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128627-1	A	WAVEGUIDE, WR-137, RIGID, 9797B	
2	1 EA	112991-4	E1	WAVEGUIDE, WR-137, FLEXGUIDE, 12 IN	
3	1 EA	112991-5	E1	WAVEGUIDE, WR-137, FLEXGUIDE, 18 IN	
4	1 EA	112988-4	B2	WAVEGUIDE, WR-137, 90 DEG E-BEND, 2 X	
5	1 EA	122592-3020		WAVEGUIDE, WR-137, EXTENSION, 2.0 IN	
10	2 EA	115997-2	G1	BRACKET, RIGID WAVEGUIDE	
11	2 EA	115997-3	H	BRACKET, WAVEGUIDE	
12	2 EA	115998-1	J5	STRAP, RIGID WAVEGUIDE, WR-137	
20	6 EA	118294-3	B	HARDWARE KIT, WR-137 FLANGE	
21	6 EA	117218-2		GASKET, WR-137, (CPRG FULL)	
50	4 EA	114588-827		SCREW, PAN HD, PHIL, 10-32 x 3/8, S.S	
51	4 EA	114588-836		SCREW, PAN HD, PHIL, 10-32 x 1-1/2, S	
52	4 EA	114581-011		WASHER, LOCK, #10, S.S.	
53	8 EA	114580-011		WASHER, FLAT, #10, S.S.	

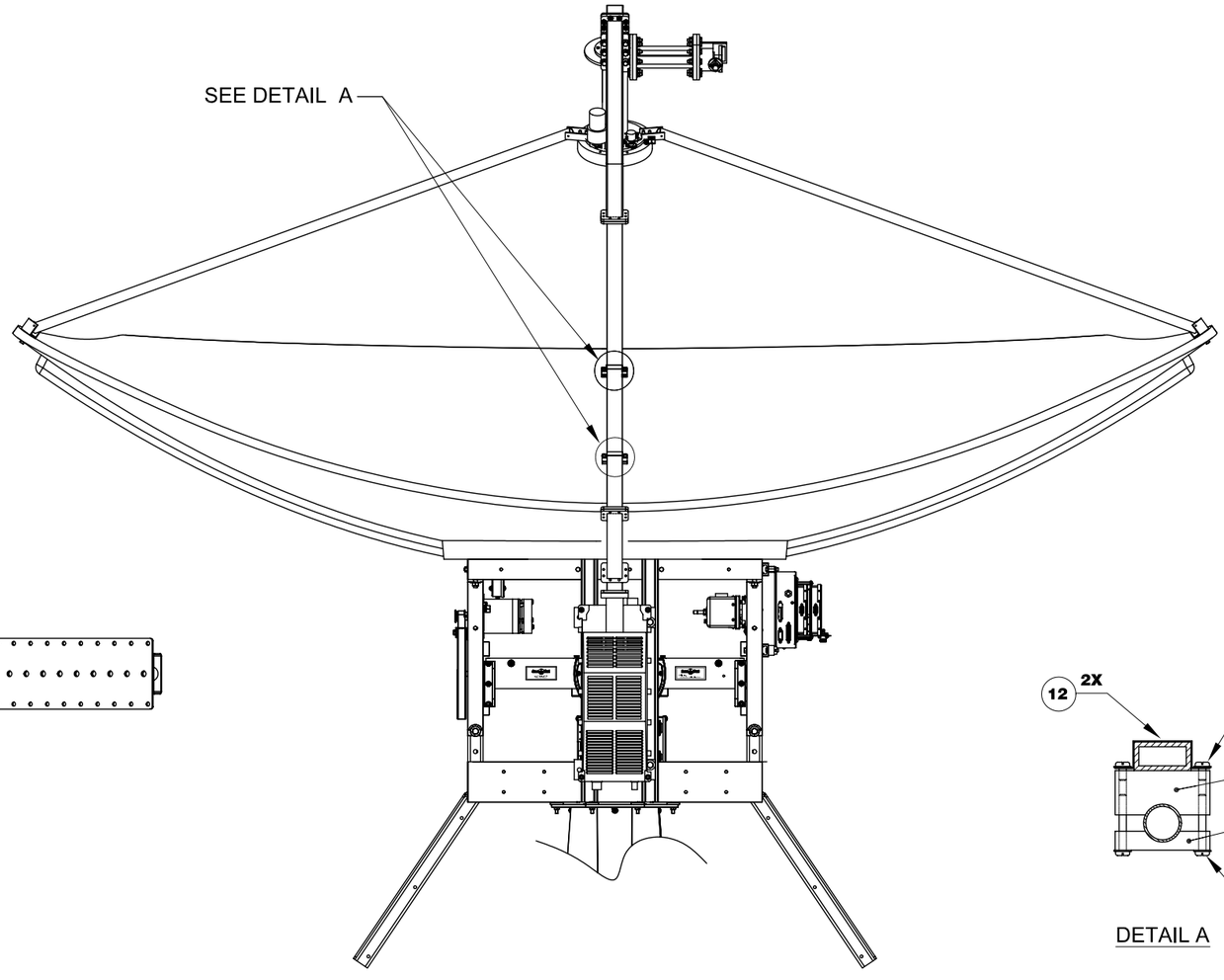
Sea Tel
COBHAM

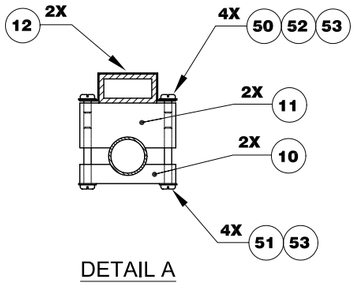
WAVEGUIDE RUN ASS'Y, 9797B-70, 40 WATT

PROD FAMILY COMMON	EFF. DATE 4/28/2009	SHT 1 OF 2	DRAWING NUMBER 128423-1	REV A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6586	3-13-09	RELEASED TO PRODUCTION, WAS X4	K.D.H.







DETAIL A

128423-1

DASH	DESCRIPTION
-1	40 WATT
-2	60 WATT

NOTES: UNLESS OTHERWISE SPECIFIED.

1. APPLY ADHESIVE PER SEATEL SPEC 121730.
2. CIRCULAR FEED SHOWN WAVEGUIDE RUN IS SAME FOR LINEAR SYSTEMS.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M - 1994

MATERIAL: SEE BOM

FINISH: N/A

DRAWN BY: SMS

DRAWN DATE: 6-24-08

APPROVED BY:

APPROVED DATE:

Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: **WAVEGUIDE RUN ASS'Y 9797B-70**

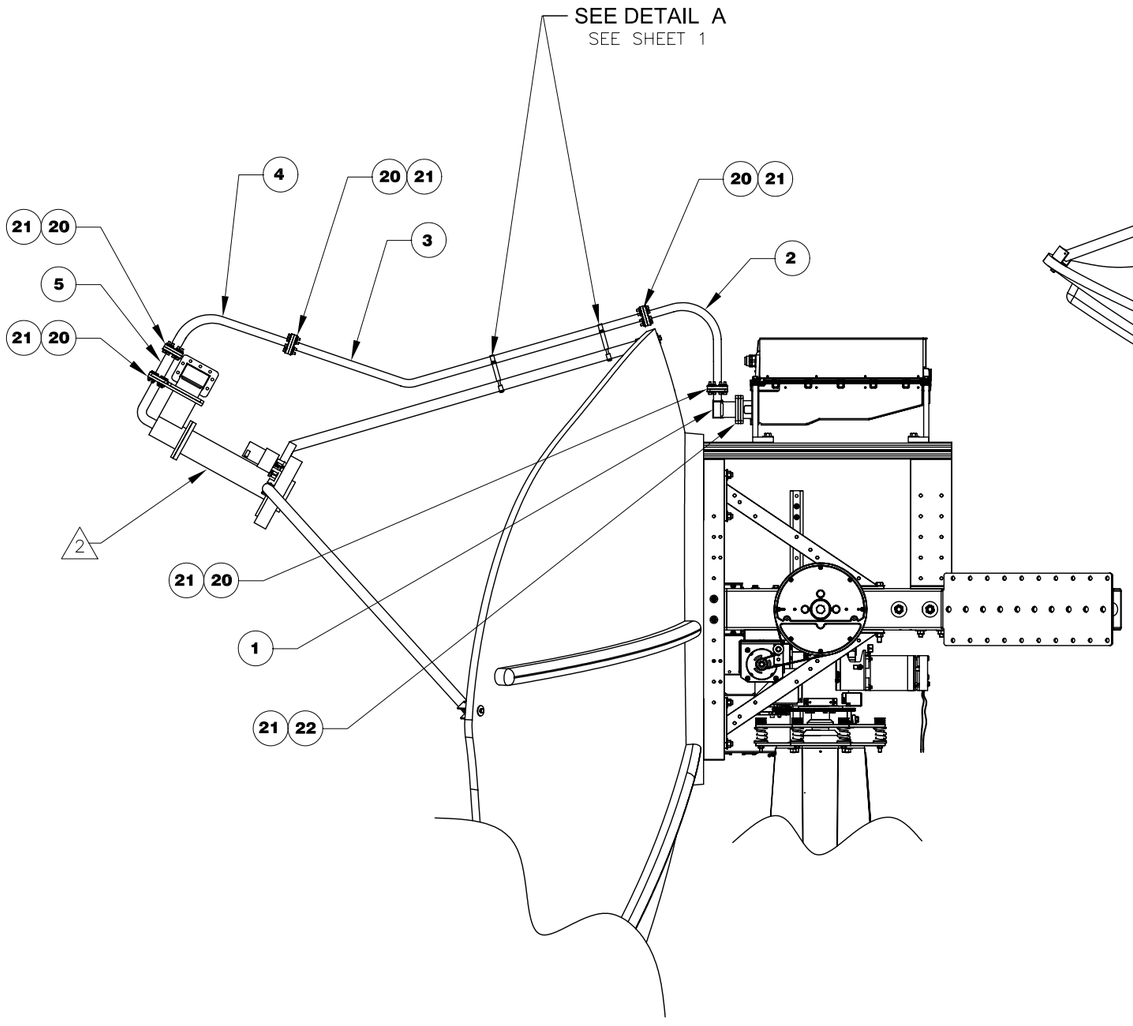
SIZE: B | SCALE: NONE | DRAWING NUMBER: 128423 | REV: A

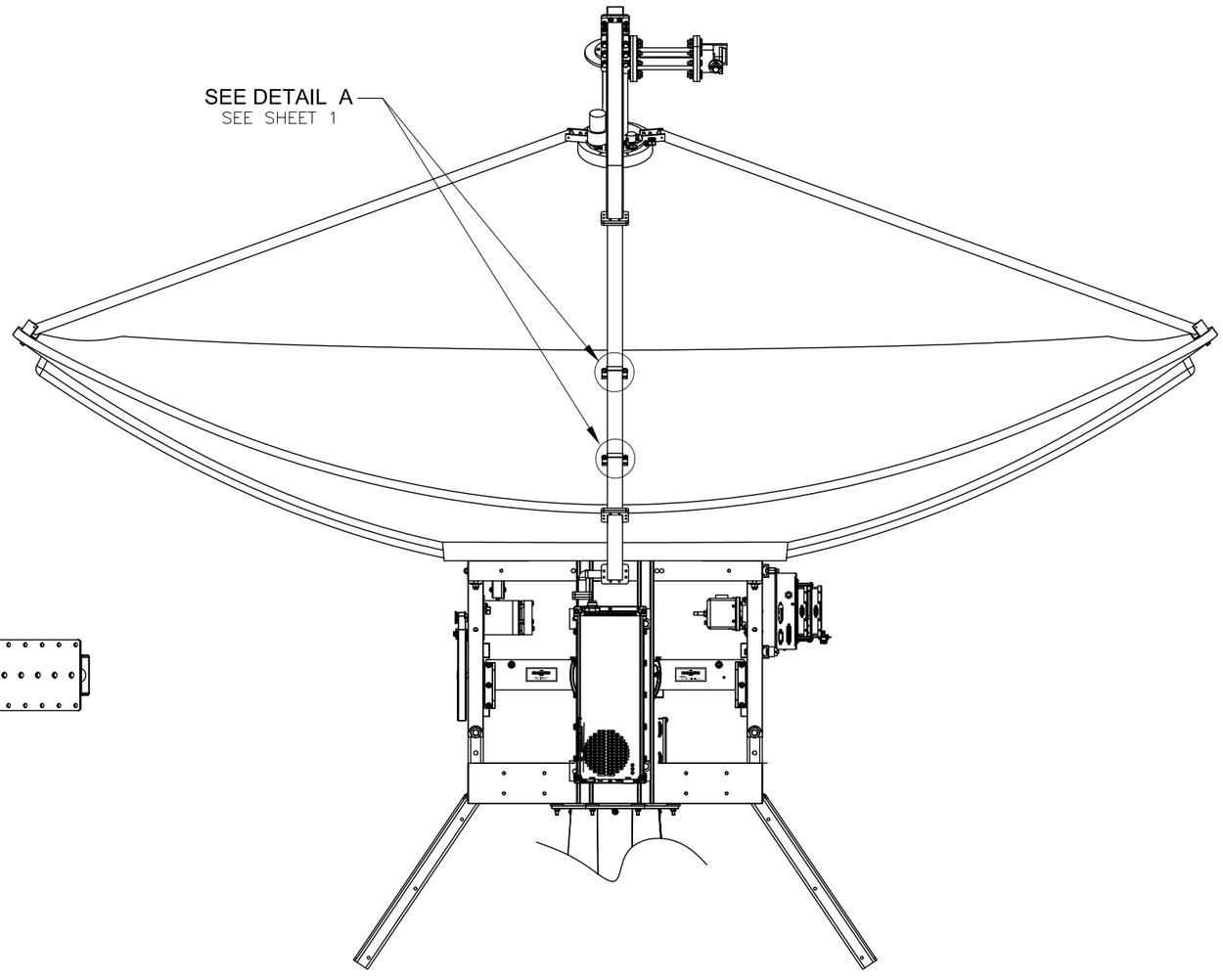
3rd ANGLE PROJECTION

FIRST USED: 9797B-70

SHEET NUMBER: 1 OF 2

DOCUMENT NO. 124225-4_A





128423-2

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	128423	A
		SHEET NUMBER: 2 OF 2	

DOCUMENT NO. 124225-4_A

SINGLE LEVEL MFG BILL OF MATERIAL

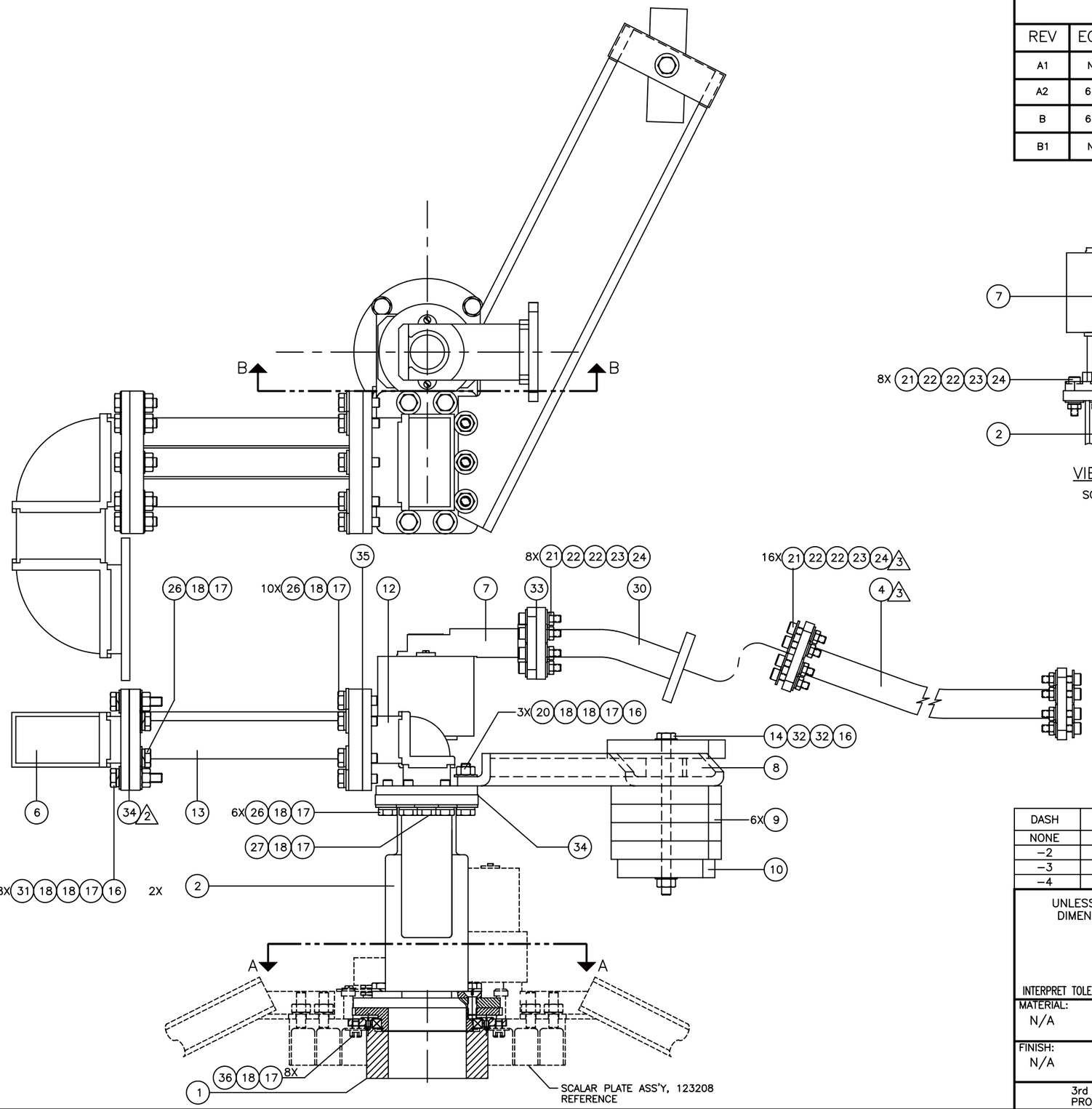
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	123290	A	THROAT ASS'Y, C-BAND, LINEAR, DISHSCA	
2	1 EA	116922	B1	OMT-46, C-BAND	
3	1 EA	117543	A	STOP, POLANG	
5	1 EA	115509	D	WAVEGUIDE, WR-137, ROTARY JOINT, L-ST	
8	1 EA	117218-2		GASKET, WR-137, (CPRG FULL)	
9	1 EA	118294-3	B	HARDWARE KIT, WR-137 FLANGE	
10	1 EA	117696-2	A	WAVEGUIDE, WR-229, 90 DEG E-BEND	
11	1 EA	129948-1	A2	C BAND RADAR TRANSMIT REJECT FILTER	
12	1 EA	129950	A	WAVEGUIDE, WR-229, 180 DEG, H BEND	
13	3 EA	123618-37		GASKET, WR-229, CPR-229G, CHOKE	
20	1 EA	119062	B	BRACKET, FEED BALANCING	
21	1 EA	118560	B	WEIGHT, TRIM, 1 x 3.38 x 3, 2.8 LBS	
50	8 EA	114593-162		SCREW, SOCKET HD, 10-32 x 3/8, S.S.	
57	8 EA	114580-011		WASHER, FLAT, #10, S.S.	
58	8 EA	114581-011		WASHER, LOCK, #10, S.S.	
60	2 EA	114586-535		SCREW, HEX HD, 1/4-20 x 1/2, S.S.	
61	2 EA	114576-539		SCREW, FLAT HD, PHIL, 1/4-20 x 5/8, S	
62	27 EA	114586-537		SCREW, HEX HD, 1/4-20 x 3/4, S.S.	
63	3 EA	114622-544		SCREW, HEX HD, FULL THRD, 1/4-20 x 1-	
64	2 EA	114586-543		SCREW, HEX HD, 1/4-20 x 2, S.S.	
67	32 EA	114581-029		WASHER, LOCK, 1/4, S.S	
68	41 EA	114580-027		WASHER, FLAT, 1/4, SMALL PATTERN, S.S	
69	5 EA	114583-029		NUT, HEX, 1/4-20, S.S.	

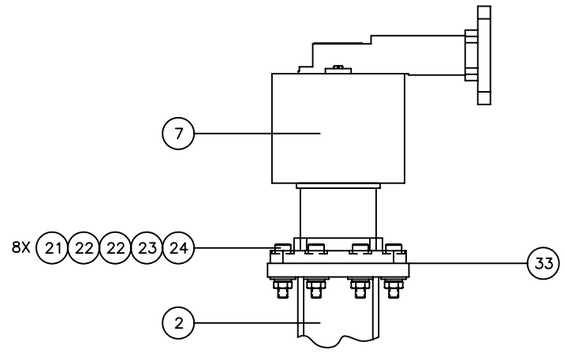
Sea Tel
COBHAM

9797B FEED SUB-ASS'Y, C-BAND, LIN., DSHSCN, W/O FLEX&BEND

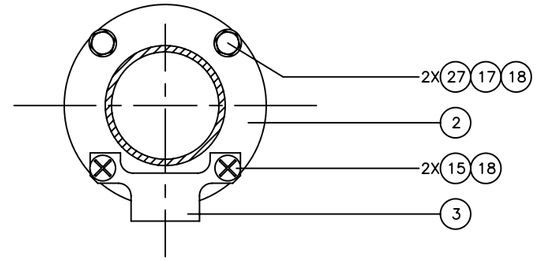
PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	4/28/2009	1 OF 2	123285-4	C

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A1	N/A	8–22–05	DASH 2 ADDED	JP
A2	6104	04–03–08	ITEM 16 WS QTY 20; ITEM 17 WS QTY 40; ITEM 19 WS QTY 51; ITEM 22 WS QTY 64; ITEM 22 WS QTY 64; ITEM 23 WS QTY 32; ITEM 26 WS QTY 19; ITEM 27 WS QTY 2; ADDED ITEMS 32–36.	RJW
B	6166	04–24–08	ITEM 20 WS 119927	RJW
B1	N/A	6–3–08	ADDED –4; UPDATED TABLE WITH CORRECT DESCRIPTIONS	SMS





VIEW B–B
SCALE: 1/2



SECTION A–A
SCALE: 1/2

REFERENCE DATA:

FREQUENCY:	Rx: 3.7 GHz TO 4.2 GHz Tx: 5.85 GHz TO 6.425 GHz
POLARIZATION:	DUAL LINEAR ORTHOGONAL
CROSS–POL:	Rx: 27dB MIN. (RECOMMENDED) Tx: 27dB MIN.
VOLTAGE AXIAL RATIO:	1.3:1
F/D:	.245

NOTES, UNLESS OTHERWISE SPECIFIED:

1. APPLY ADHESIVE PER SEA TEL SPEC. 121730.
2. ITEM 34 IS SUPPLIED WITH ITEM 13.
3. PROTECT FLEXIBLE WAVEGUIDE (ITEM 4) FROM DAMAGE, PLACE INTO BAG ALONG W/HARDWARE ITEMS 21, 22, 23, AND 24, PER QTYS. SPECIFIED AND TIE WRAP TO ASS'Y.

DASH	DESCRIPTION
NONE	XX97A TX FILTER / FIELD INSTALL
–2	XX97A TX FILTER W/ RADAR FILTER
–3	XX97A TX FILTER W/ CFE FLTR
–4	9797B TX FILTER W/O FLEX & E–BEND (ITEM 30)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M – 1994

MATERIAL: N/A

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: JP

DRAWN DATE: 6/28/04

APPROVED BY:

APPROVED DATE:

Sea Tel®
4030 NELSON AVENUE
CONCORD, CA 94520
Tel. 925–798–7979 Fax. 925–798–7986

TITLE: FEED SUB–ASS'Y, C–BAND, LINEAR, DISHSCAN

SIZE: B | SCALE: 1:3 | DRAWING NUMBER: 123285 | REV: B1

FIRST USED:

SHEET NUMBER: 1 OF 1

DOCUMENT NO. 124225–4_A

SINGLE LEVEL MFG BILL OF MATERIAL

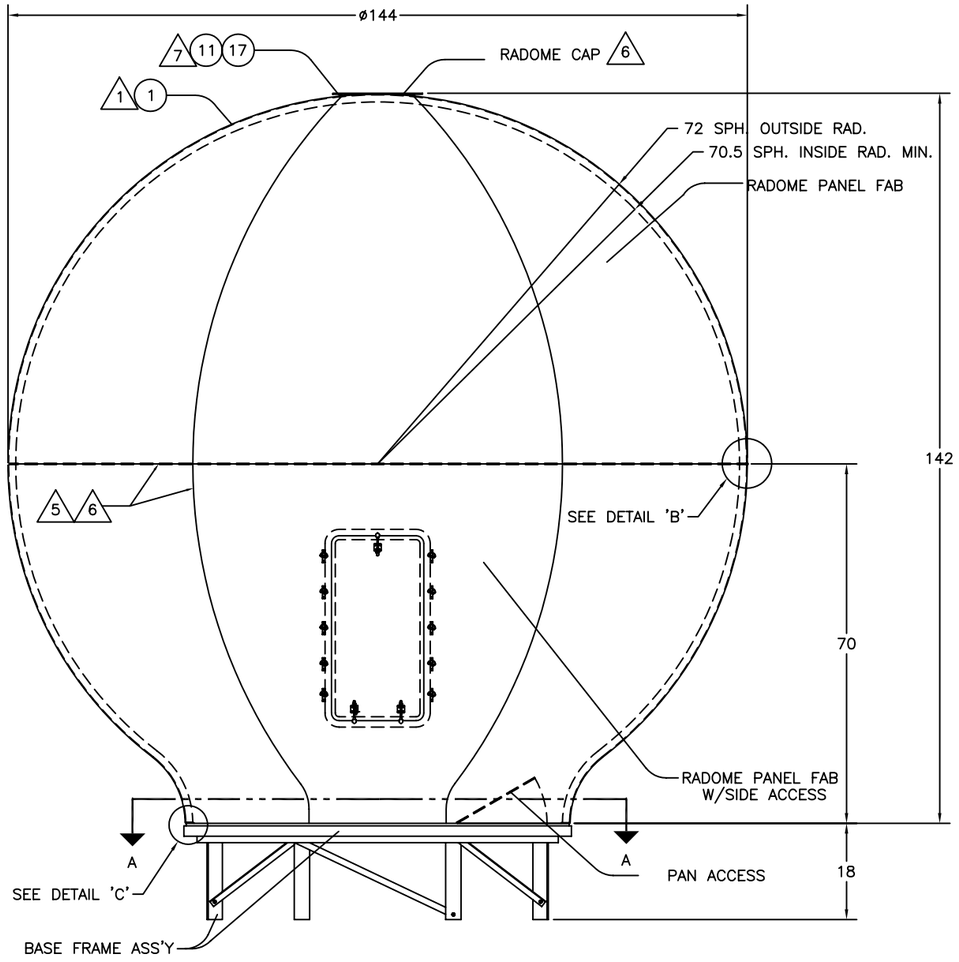
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
	12 EA	117762-1	B	SILICONE ADHESIVE, WHT RTV 122, 10.1	NOT SHOWN
	1 EA	110327	M	HARDWARE KIT, 144 INCH RADOME	NOT SHOWN
1	1 EA	109119-17	F2	RADOME FAB ASS'Y, 144 INCH, WHITE/SID	
9	3 EA	124903-1	B1	STRAIN RELIEF ASS'Y	
11	0 EA	114586-538		SCREW, HEX HD, 1/4-20 x 1, S.S.	INCLUDED IN HARDWARE KIT
12	0 EA	114586-541		SCREW, HEX HD, 1/4-20 x 1-1/2, S.S.	INCLUDED IN HARDWARE KIT
14	0 EA	114625-107		WASHER, FENDER, 1/4, (1 IN OD), S.S.	INCLUDED IN HARDWARE KIT
17	0 EA	114583-029		NUT, HEX, 1/4-20, S.S.	INCLUDED IN HARDWARE KIT
28	1 EA	109783-2		WRENCH, L	

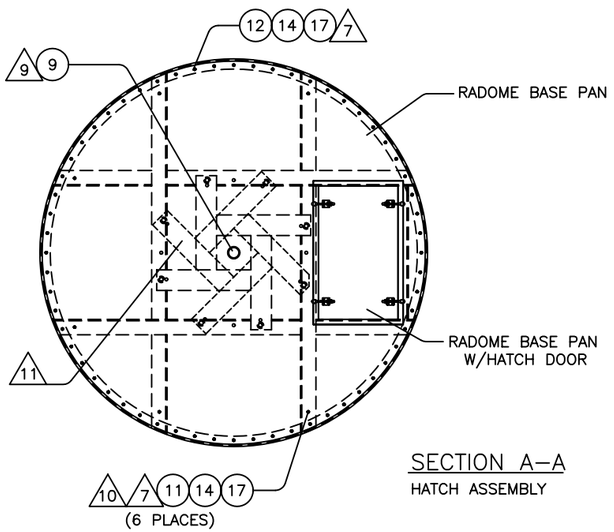
Sea Tel

RADOME ASS'Y, 144 INCH, WHITE/SIDE ACCESS

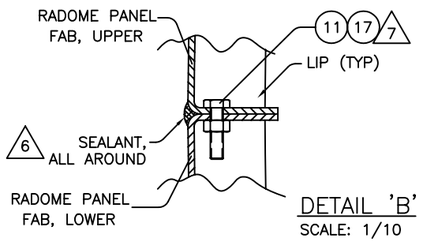
PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	25-Sep-08	1 OF 1	**111365-17**	**N1**

REV.	ECO#	DATE	DESCRIPTION	BY
D		6-13-97	REDRAWN; REV. C FILED OBSOLETE.	MAB
E		5-13-98	ITEM 5 P/N 110965-6 ADD'D.	MAB
F		6-23-98	BASE STAND MOUNTING LOCATION ADD'D TO SECTION A-A; NOTE 12 ADD'D.	MAB
G		7-8-98	DASH No's 9-16 ADD'D; NOTES 2 & 3 CHG'D FOR CORRECT BASE PAN & DASH No's.	MAB
H		5-24-99	ITEM 21 ADD'D.	DF
I		1-5-00	DASH No's 17-24 & PAN ACCESS CLMN ADD'D TO DASH TABLE; NOTES 2C & 2D ADD'D; ITEM 1 P/N's 109119-17 THRU -24 ADD'D.	MAB
J	3900	4-7-03	ADD'D ADDITIONAL LATCH TO SIDE DOOR; NOTE 5 " APPLYING GASKET"; ITEMS 19, 20 & 22 ; AND DASH 25. RENUMBERED NOTE ITEMS & CORRECTED BALLOONS. FOR ASSY W/SIDE ACCESS: CHG LATCH 108959 ITEM 31 TO QTY 3; SCREW 114587-829 ITEM 19 TO QTY 12; WASHER 114580-011 ITEM 20 TO QTY 12; NUT 114583-011 ITEM 22 TO QTY 12. FOR ASSY W/SIDE & PAN ACCESS: CHG ITEM 31 TO QTY 7; ITEM 19 TO QTY 28; ITEM 20 TO QTY 28 & ITEM 22 TO QTY 28.	LK
K	4083	10-08-03	CHANGED STRAIN RELIEFS FROM 109258-1 TO 109258-8. UPDATED BOM & DWG NOTES, BALLOON #'S & QTY TO MATCH CURRENT BUILD. REARRANGED DASH TABLE.	LK
L	4490	07-26-04	MOVE HW FOR SIDE ACCESS TO RADOME FAB ASSY. DEL ITEMS 19-20,22,29-33,35,SHEET 2.	AMN
M	4941	07-14-05	SILICON ADHESIVE CHANGED TO CLEAR FOR DASH 21.	VS
M1	N/A	9-6-05	ADDED DASH 26	LK
N	5050	11-7-05	STRAIN RELIEF WAS 109258-8	LK
N1	N/A	10-17-07	ADDED DASH 27	CK

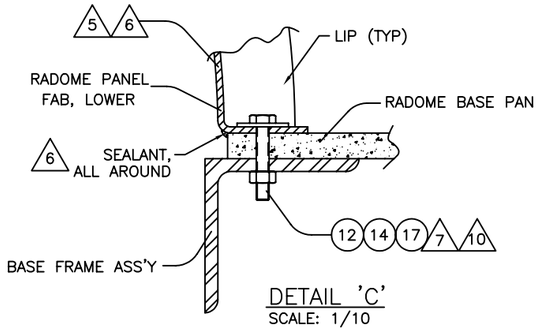




SECTION A-A
HATCH ASSEMBLY



DETAIL 'B'
SCALE: 1/10



DETAIL 'C'
SCALE: 1/10

DASH TABLE

DASH NO'S	CONFIGURATION		
	COLOR	FOAM	SIDE ACCESS
-1	WHITE	YES	YES
-17	WHITE	YES	YES
-18	WHITE	YES	YES
-21	US NAVY GREY	YES	YES
-25	BRIT GREY	YES	YES
-26	DANISH NAVY GREY	YES	YES
-27	SNOW WHITE	YES	YES

NOTES:
1. SELECT RADOME FAB ASS'Y 109119 AS PER SPECIFICATIONS IN CUSTOMERS SALES ORDERS.
2. N/A.
3. N/A.
4. APPLY ADHESIVE PER SEATEL SPEC. 121730.
5. APPLY MASKING TAPE ALONG VERTICAL AND HORIZONTAL EDGES OF ALL PANELS PRIOR TO CAULKING.
6. USE SILICON ADHESIVE TO SEAL VERTICAL AND HORIZONTAL EDGES OF ALL PANELS, RADOME CAP, AND ON BASE PAN UNDER PANELS.
7. APPLY ADHESIVE AS PER SEATEL SPEC 121730 TO ALL THREADED FASTENERS AT TIME OF FINAL ASSEMBLY AND TIGHTEN WITH TORQUE WRENCH PER FOLLOWING TABLE:

BOLT DIA.	THREAD PITCH	FT. LBS.	THREAD PITCH	FT. LBS.
1/4"	20	5.5	28	6.0
5/16"	18	10.0	24	11.4
3/8"	16	21.7	24	24.5
7/16"	14	32.4	20	38.4
1/2"	13	43.5	20	54.6
9/16"	12	57.5	18	68.0
5/8"	11	86.0	18	102.0
3/4"	10	152.0	16	182.0

8. BASED ON WIND VELOCITY OF 100 MPH:
   HORIZONTAL WIND SHEAR: 870 FT. LBS.
   VERTICAL LIFT EACH LEG MAX.: 580 FT. LBS.
   OVERTURNING MOMENT: 6,380 FT. LBS.
9. INSTALLED BY CUSTOMER (REQUIRED HOLE SIZE ø1.28).
10. MATCH DRILL AT ASSEMBLY.
11. ORIENTATION OF BASE STAND ASSEMBLY WHEN USED WITH COOLING UNIT ASSEMBLY, REFERENCE GENERAL ASSEMBLY.

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'
3rd ANGLE PROJECTION

Sea Tel

SCALE: 1/20 | APPROVED BY: | DRAWN BY: MAB
DATE: 6-13-97 | DRAWING SIZE: C

TITLE: RADOME ASSEMBLY, 144"

MODEL: 144" RADOME | SHEET: 1 OF 1 | DRAWING NUMBER: 111365 | REVISION: N1

DOCUMENT NO. 117085 REV. C

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	123724-1	B	RADOME BASE FRAME ASS'Y, 75 IN, STEE	
2	1 EA	123726-1	B1	RADOME BASE PAN FAB, WHITE	
3	1 EA	123728-2	A	RADOME PAN ACCESS ASS'Y, WHITE	
50	6 EA	114586-540		SCREW, HEX HD, 1/4-20 x 1-1/4, S.S.	
52	12 EA	114580-029		WASHER, FLAT, 1/4, S.S.	
53	6 EA	114583-029		NUT, HEX, 1/4-20, S.S.	

Sea Tel

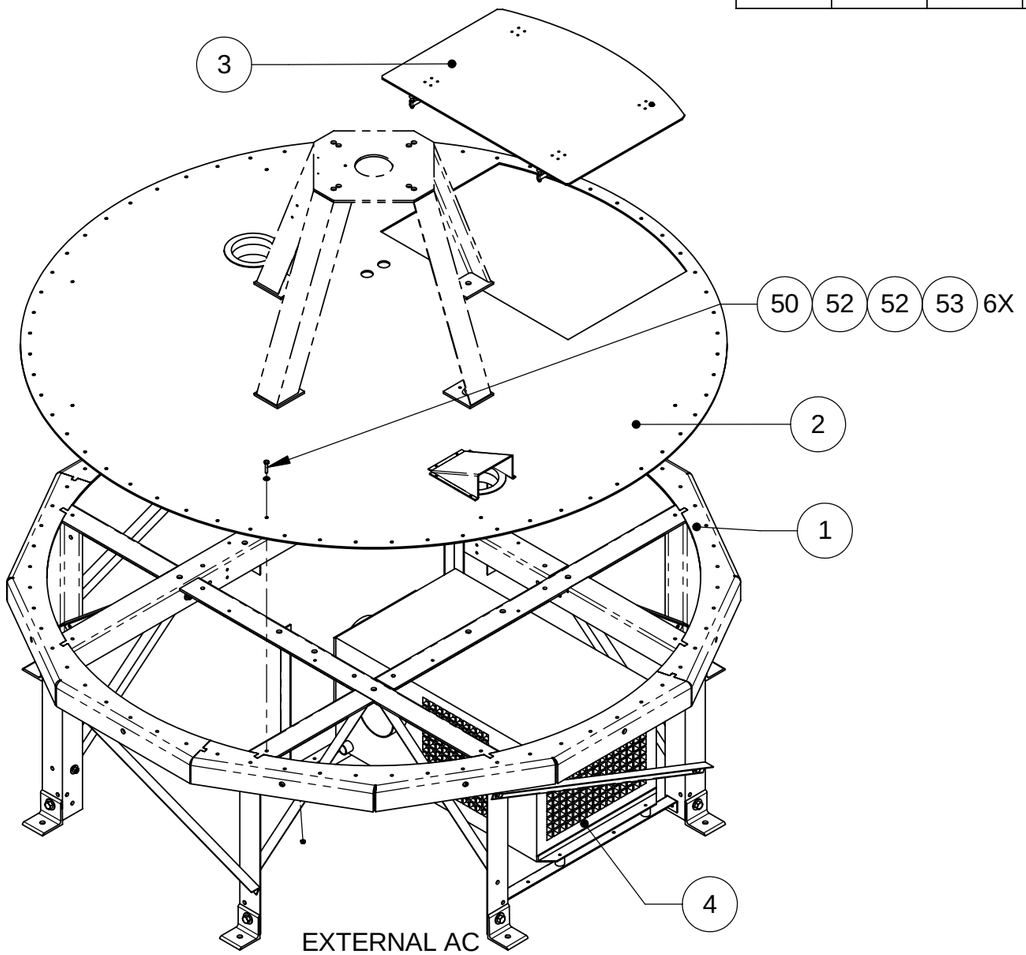
RADOME BASE ASS'Y, 75 IN., STL, NO AC, WHT PAN

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	02-Sep-08	1 OF 1	**123723-1**	**B1**

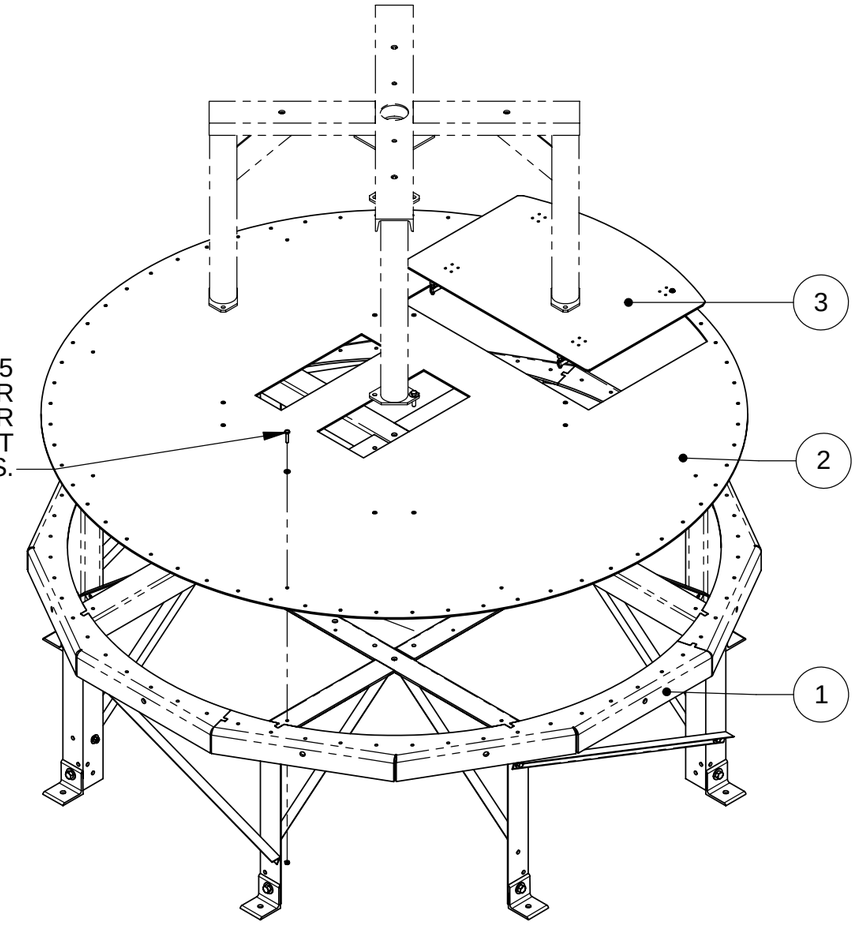
NOTES: (UNLESS OTHERWISE SPECIFIED)

1. APPLY ADHESIVE PER SEA TEL SPEC. 121730.

REV.	ECO#	DATE	DESCRIPTION	BY
A	N/A	1-14-05	RELEASED TO PRODUCTION	AMN
A1	NONE	04-13-05	-9 ADDED	AEF
A2	NONE	04-29-05	-9 BASE FRAME WS STL. LG. FOOT, BASE PAN WS P/N 123726-2	MSF
B	4888	05-31-05	FOR -5, -6, -8, -9 BASE PAN WAS P/N 123726-1.	V.S.
B1	N/A	01-24-07	ADD INTERNAL AC PAN FAB CUTOUTS (NOT PREVOUSLY SHOWN).	SL.



EXTERNAL AC



INTERNAL AC (REF. ONLY)

DASH #	BASE FRAME	AC OPTION	COLOR	BASE PAN	BASE PAN ACCESS ASSY
-1	STL.	NO	WHITE	123726-1	123728-2
-2	AL.	NO	WHITE	123726-1	123728-2
-3	STL.	NO	US NAVY GREY	123726-2	123728-3
-4	STL.	NO	BRT GREY	123726-3	123728-4
-5	STL.	EXTERNAL	WHITE	124458-1	123728-2
-6	AL.	EXTERNAL	WHITE	124458-1	123728-2
-7	STL. LG. FOOT	NO	WHITE	123726-1	123728-2
-8	STL. LG. FOOT	EXTERNAL	WHITE	124458-1	123728-2
-9	STL	INTERNAL	WHITE	124459-1	123728-2

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'
3rd ANGLE PROJECTION

Sea Tel

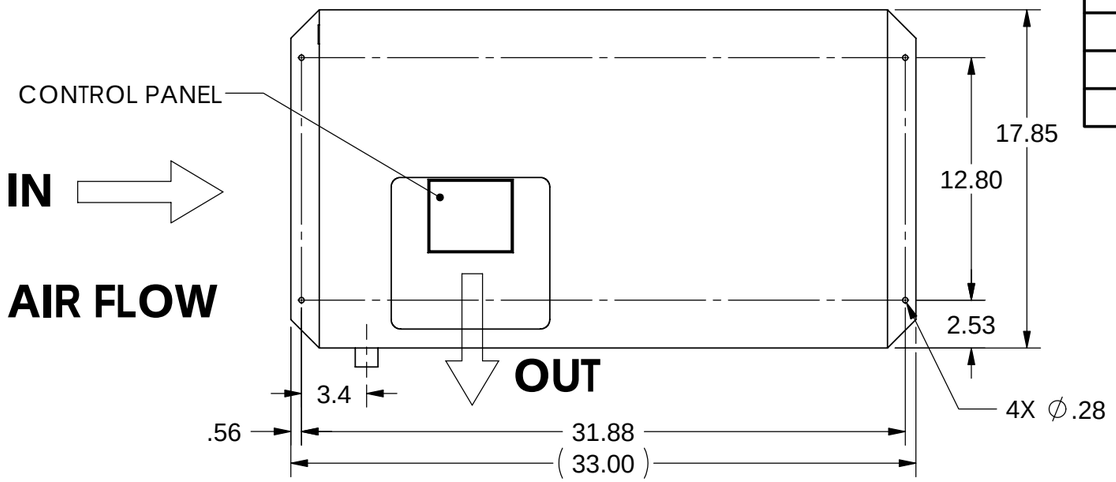
SCALE: 1:16 | APPROVED BY: | DRAWN BY: SCC
DATE: 12-14-04 | DRAWING SIZE: B

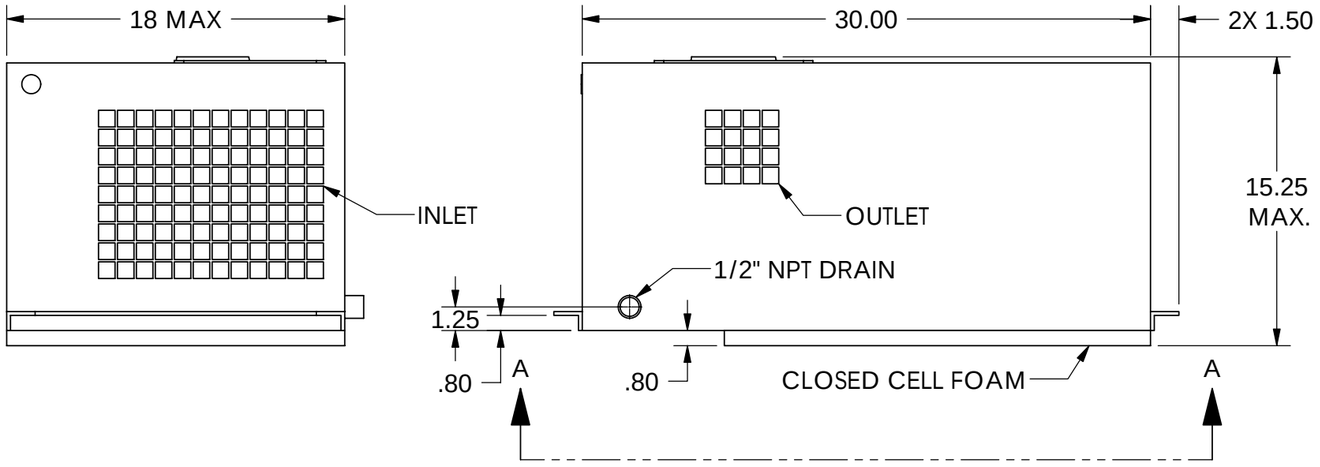
TITLE: RADOME BASE ASSY, 75 IN.

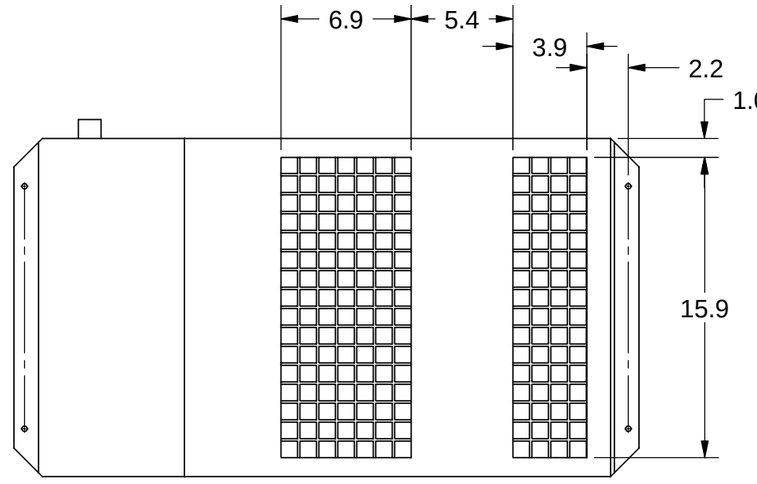
MODEL: XX97 | SHEET: 1 OF 1 | DRAWING NUMBER: 123723 | REVISION: B1

DRAWING CREATED IN SOLIDWORKS

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	4609	10-05-04	RELEASED TO PRODUCTION	AMN
B	4858	5-5-05	ADD REFERENCE 121113	LR
C	N/A	3-2-06	CHANGED TO TABLE FORMAT	V.S.
C1	N/A	1-9-07	CREATED CAD OUTLINE DRAWING	RJW







VIEW A-A

BOTTOM VIEW

Dash	Rated Cooling Capacity (BTU)	Voltage (VAC)	Rated Current	Frequency (Hz)	Refrigerant	System Controller	Manufacturer	Manufacturers Part Number	Manufacturers Description
-1	16,000	110	20A	60	R417A	Digital	Dometic	202000307	HSA16KC/2 417A RADOME 115V
-2	16,000	220	12A	50/60	R417A	Digital	Dometic	202000304	HSA16KCZ/2 417A RADOME 230/1
-3	16,000	230	12A	60	R417A	Digital	Dometic	TBD	TBD
-4	16,000	230	12A	50	R417A	Digital	Dometic	202000354	HSA16KCZ50 417A 220V/50/1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5M - 1994

MATERIAL: N/A

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: RJW

DRAWN DATE: 1/8/2007

APPROVED BY:

APPROVED DATE:

SIZE: B

SCALE: 1:8

SeaTel®
4030 NELSON AVENUE
CONCORD, CA 94520
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: AIR CONDITIONER, INTERNAL

DRAWING NUMBER: 123496

REV: C1

FIRST USED:

SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

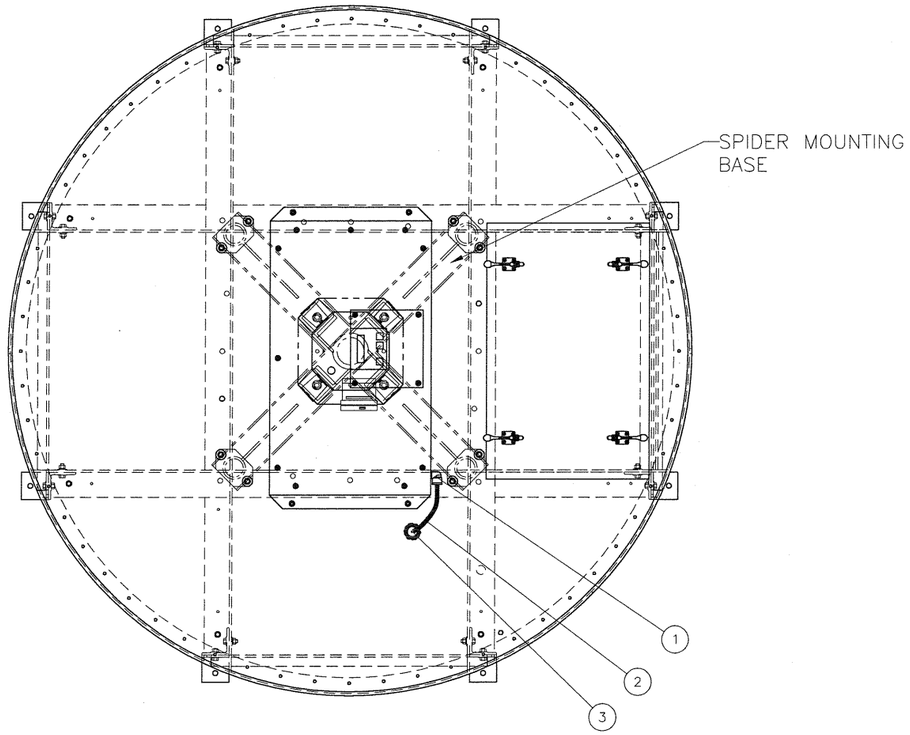
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	116941	0	STREET ELBOW, 1/2 INCH	
2	1 EA	116938	0	FLEX HOSE, 1/2 INCH	
3	2 EA	124903-1	B1	STRAIN RELIEF ASS'Y	
4	1 EA	121008-72	D2	CABLE ASS'Y, AC INPUT, 72 IN. (SPADE	(NOT SHOWN)
6	4 EA	120470		ISOLATORS, BUMPER	
60	4 EA	114586-535		SCREW, HEX HD, 1/4-20 x 1/2, S.S.	
61	4 EA	114586-537		SCREW, HEX HD, 1/4-20 x 3/4, S.S.	
62	8 EA	114581-029		WASHER, LOCK, 1/4, S.S	
63	4 EA	114625-107		WASHER, FENDER, 1/4, (1 IN OD), S.S.	

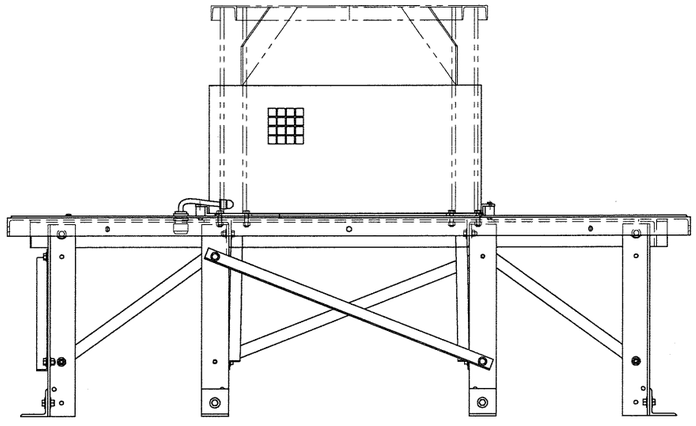
Sea Tel
COBHAM

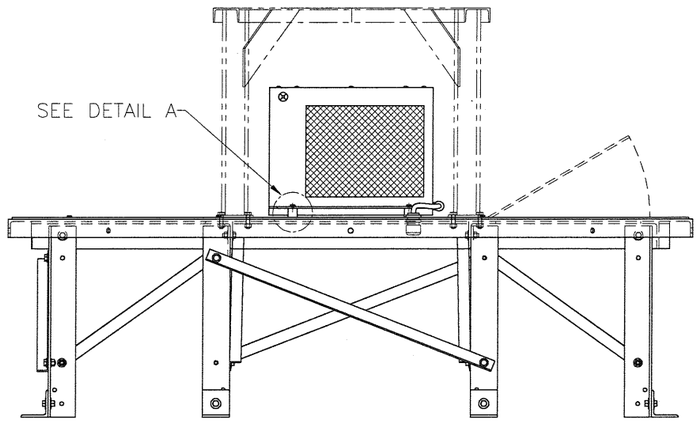
A/C INSTALL ASS'Y, INTERNAL

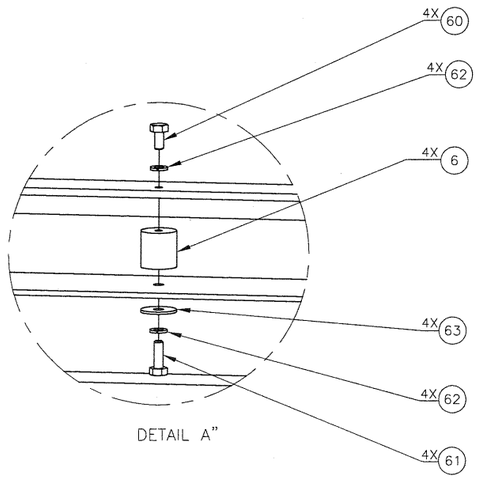
PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	12/28/2009	1 OF 1	122508	E

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	7-15-04	RELEASED TO PRODUCTION; CHANGED REV FROM X2 TO A	CDZ
B	4858	5-5-05	ADD ITEM 5 115708-3 & HARDWARE ITEMS 50 THRU 52	L.R.
C	5050	11-11-05	ITEM 3 WAS P/N 109258-8.	V.S.
D	5133	02-21-06	IN NOTE 2: P/N 121008-72 WS 121008-36 & P/N 124903-1 WS 109258-8	R.W.
E	6475	12-4-08	REMOVED ITEMS 5, 50, 51, 52 & NOTE 4; ADDED ITEMS 6, 60 THRU 63; NOTE 3 WS "BAG AND ATTACH POWER CORD AND STRAIN RELIEF"; ADD EXPLODE VIEW	K.D.H.









DETAIL A"

REFERENCE DOCUMENTS:

122005, MANUAL, RADOME A/C

122006, QUICK START CARD, RADOME A/C

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
2. AC POWER CORD (P/N 121008-72) AND STRAIN RELIEF (P/N 124903-1) INSTALLED BY CUSTOMER.
3. BAG TAG ALL ITEMS ON BOM AND INCLUDE WITH A/C UNIT.

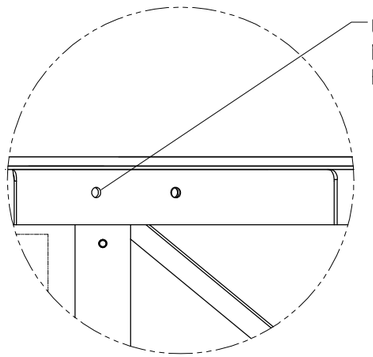
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5' INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: V.S.	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
	DRAWN DATE: 11-19-03	
	APPROVED BY:	TITLE: A/C INSTALL ASS'Y, INTERNAL
MATERIAL: N/A	APPROVED DATE: 12/17/08	
FINISH: N/A	SIZE: D / SCALE: 1/10	DRAWING NUMBER: 122508 / REV: E
3rd ANGLE PROJECTION	FIRST USED: XX97	SHEET NUMBER: 1 OF 1

DOCUMENT NO. 124225-4_A

NOTES: (UNLESS OTHERWISE SPECIFIED)

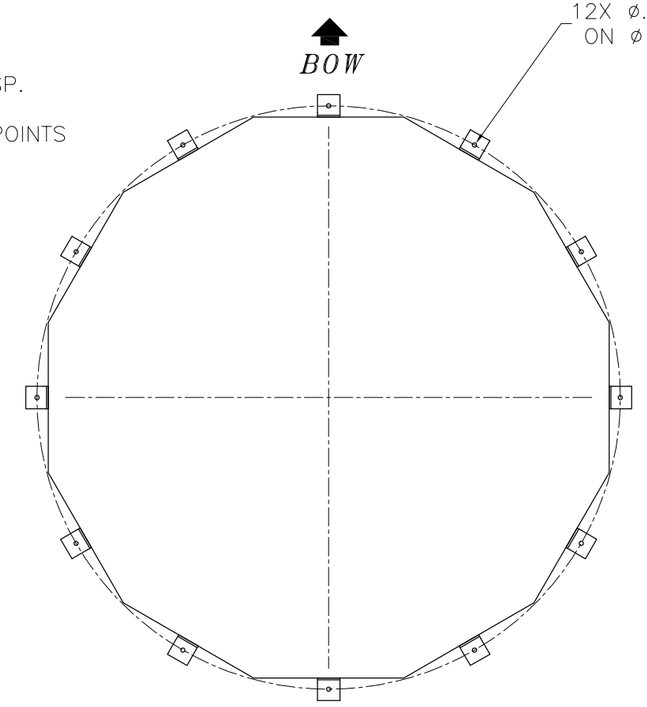
1. ALL WEIGHTS GIVEN ARE FOR INFORMATION ONLY.
   DO NOT USE FOR DESIGN. REFER TO 121910.
2. SEATEL DOES NOT PROVIDE LIFTING HARDWARE OR STRAPS.

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
B1	N/A	11-1-05	SHT. 2: TABLE 1 MODEL 9797A-50 WEIGHT WS 720; MODEL 9797A-59, 56, 66, 62 & 8797A-29 WEIGHT ADDED	MSF

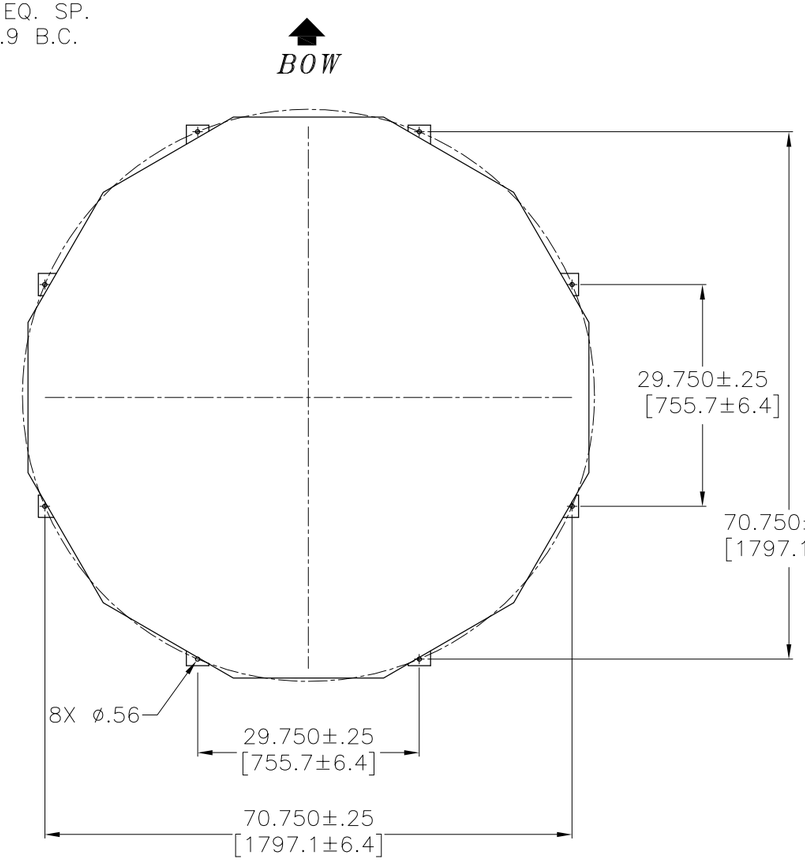


DETAIL A

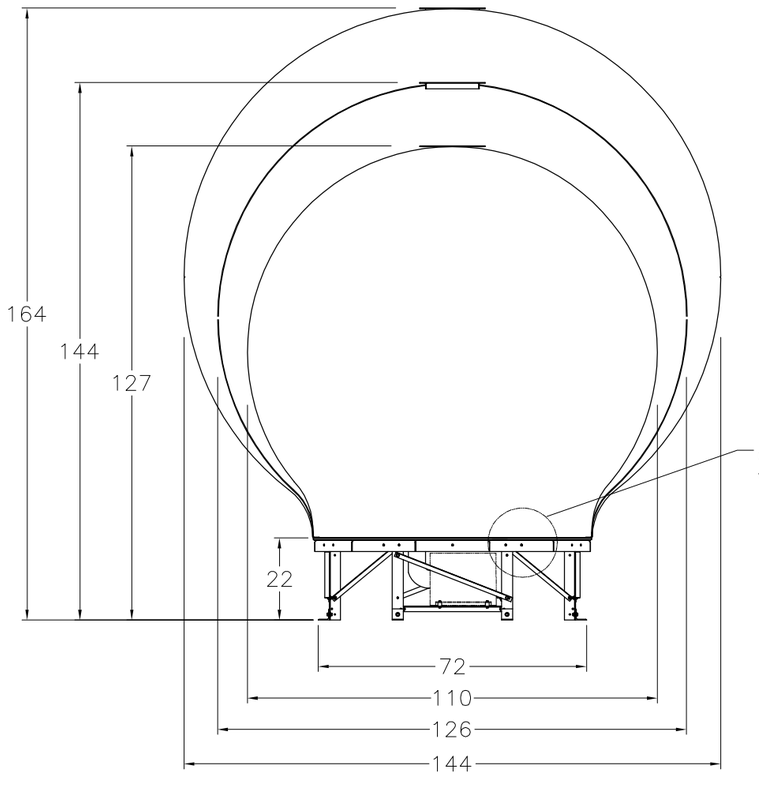
SCALE: NONE



FLUSH MOUNT RADOME
MOUNTING HOLE PATTERN



MOUNTING HOLE PATTERN
W/LEGS



SCALE: NONE

TOLERANCES UNLESS OTHERWISE SPECIFIED X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: SCC DRAWN DATE: 01-03-05 APPROVED BY: APPROVED DATE:	Sea Tel® 4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL:		TITLE: INSTALLATION ARRANGEMENT	
FINISH:	SIZE: B SCALE: 1:20	DRAWING NUMBER: 123908	REV: B1
3rd ANGLE PROJECTION	FIRST USED: XX97A	SHEET NUMBER: 1 OF 2	

DOCUMENT NO. 124225-4_A

TABLE 1: GENERAL ASSEMBLY WEIGHT

ITEM DESCRIPTION	NET* WEIGHT (LB.)
9797A–09	455
9797A–11	565
9797A–21	555
9797A–27	575
9797A–32	625
9797A–38	615
9797A–40	545
9797A–43 (Dual C–Band)	720
9797A–45	545
9797A–46	625
9797A–49	485
9797A–50	565
9797A–51	685
9797A–53	695
9797A–59	545
12097A–2	585
9797A–56	565
8797A–29	645
9797A–66	555
9797A–62	685

*NET WEIGHT EXCLUDES SHIPPING PALLET WEIGHT OF APPROX. 25 LB.

TABLE 2: BASE ASSEMBLY WEIGHT

ITEM DESCRIPTION	WEIGHT (Lb.) **
BASE ASSEMBLY: STEEL BASE, 21" LEGS	309
BASE ASSEMBLY: AL BASE, 21" LEGS	–
BASE ASSEMBLY: STEEL BASE, FLUSH MOUNT	–
BASE ASSEMBLY: AL BASE, FLUSH MOUNT	–

**ADD 100lbs FOR AIR CONDITIONER ASSEMBLY.

TABLE 3: RADOME ASSEMBLY WEIGHT

ITEM DESCRIPTION	WEIGHT (Lb.) ***
RADOME ASSEMBLY: 110" (DRY WEIGHT)	TBD
RADOME ASSEMBLY: 126" (DRY WEIGHT)	TBD
RADOME ASSEMBLY: 144" (DRY WEIGHT)	TBD

***WEIGHT GIVEN IS APPROXIMATE DRY WEIGHT. RADOME PANELS CAN ABSORB UP TO 50% MOISTURE BY WEIGHT.

SIZE	SCALE:	DRAWING NUMBER:	REV:
B		123908	B1
		SHEET NUMBER:	2 OF 2

DOCUMENT NO. 124225–4_A

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	127513-1	B	PCU ENCLOSURE ASS'Y, XX97B, STD	
2	1 EA	122208-1	N	LEVEL CAGE ASS'Y, SIDE EXIT, 080 P.,	
3	1 EA	115425-2	J3	POT ASS'Y (ELEX.), POLANG	
4	1 EA	114590-144		SCREW, SOCKET SET-CUP, 6-32 x 1/4, S.	
5	1 EA	117549-24	B2	SPUR GEAR 24DP, 24 TOOTH	
6	1 EA	121880-1	A1	MOTOR ASS'Y, POLANG, (PRI-FOCUS)	
7	1 EA	114590-190		SCREW, SOCKET SET-CUP, 8-32 x 1/4, S.	
8	1 EA	128879-1	A	BELT KIT, XX97B, TX/RX	

Sea Tel
COBHAM

SPARE PARTS KIT, XX97B, TX/RX, STANDARD

PROD FAMILY COMMON	EFF. DATE 12/16/2009	SHT 1 OF 1	DRAWING NUMBER **128878-1**	REV **A**

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128878-1	A	SPARE PARTS KIT, XX97B, TX/RX, STANDA	
2	1 EA	116024-3	L	SHIELDED POLANG RELAY ASS'Y	
3	1 EA	125974-1	C	MOTOR, SIZE 34, BLDC W/ BRAKE, 15-PIN	
4	1 EA	127825-1	C	TIMING PULLEY, 15T	
5	1 EA	115352-473		DOWEL PIN, 1/8 x 3/4 IN, S.S.	
6	1 EA	124039-1	D	MOTOR, SIZE 34, BLDC W/ ENCODER	
7	1 EA	116311	B	SPROCKET, 12T	
8	1 EA	115352-472		DOWEL PIN, 1/8 x 5/8 IN, S.S.	
9	1 EA	117319-10	C2	LOCTITE, 271 THREADLOCKER, 0.5ML	
10	1 EA	116059-1	H	MOTOR, LEVEL CAGE W/WIRING	
11	1 EA	122264	A	TIMING PULLEY, .080P (MXL), 24T	
12	1 EA	119985	A	SCREW, SET, 6-40 x .188 IN LG, S.S.	
13	1 EA	114789-810		TRANSPORT CONTAINER	
16	2 EA	114588-832		SCREW, PAN HD, PHIL, 10-32 x 7/8, S.S	
17	1 EA	114588-831		SCREW, PAN HD, PHIL, 10-32 x 3/4, S.S	
18	1 EA	114588-836		SCREW, PAN HD, PHIL, 10-32 x 1-1/2, S	

Sea Tel
COBHAM

SPARE PARTS KIT, XX97B, TX/RX, PREMIUM

PROD FAMILY COMMON	EFF. DATE 12/16/2009	SHT 1 OF 2	DRAWING NUMBER 128878-2	REV B

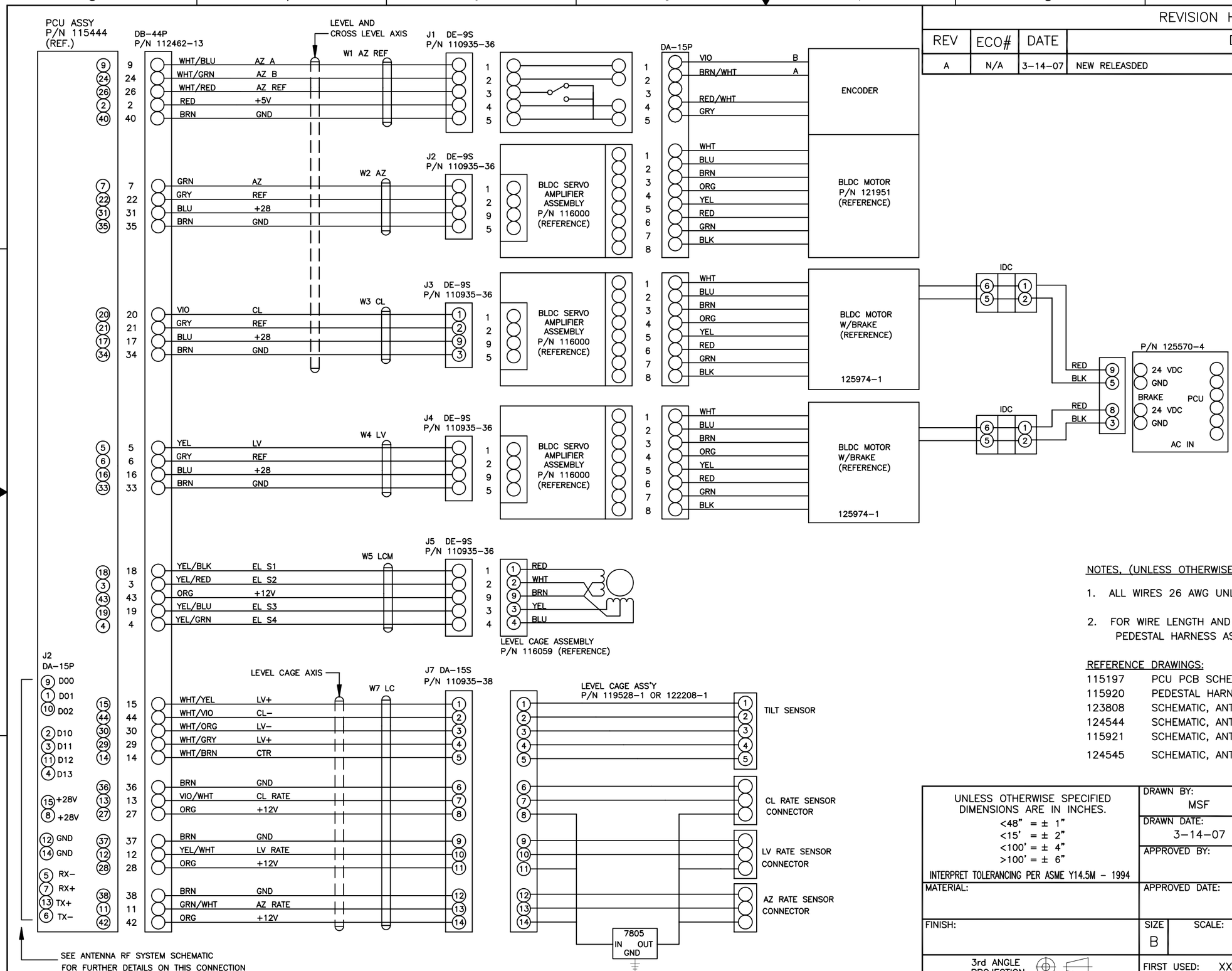
SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128878-2	B	SPARE PARTS KIT, XX97B, TX/RX, PREMIU	
2	1 EA	116034	F	HOME SWITCH ASS'Y, SHIELDED	
3	1 EA	116466	D	ROTARY JOINT, 4.5 GHz, DUAL COAX.	
4	1 EA	121250-2	C3	POWER RING ASS'Y, 22 IN, 96 IN. CONTA	
5	1 EA	116782-2	K	MODEM ASS'Y, BASE, 4-CH. RF	
6	1 EA	117611-4	H	MODEM ASS'Y, BASE, 3 CH, 50 OHM	
7	1 EA	117611-3	H	MODEM ASS'Y, PEDESTAL, 3 CH, 50 OHM	
8	1 EA	116782-1	K	MODEM ASS'Y, PEDESTAL, 4-CH. RF	

Sea Tel
COBHAM

SPARE PARTS KIT, XX97B-21/22/32, TX/RX, MASTER

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	12/16/2009	1 OF 1	128878-3	A1



REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	3-14-07	NEW RELEASDED	MSF

NOTES, (UNLESS OTHERWISE SPECIFIED):

1. ALL WIRES 26 AWG UNLESS OTHERWISE SPECIFIED.
2. FOR WIRE LENGTH AND ASSEMBY DETAILS, SEE PEDESTAL HARNESS ASSEMBLY.

REFERENCE DRAWINGS:

115197	PCU PCB SCHEMATIC
115920	PEDESTAL HARNESS ASSEMBLY
123808	SCHEMATIC, ANTENNA PEDESTAL XX96A
124544	SCHEMATIC, ANTENNA PEDESTAL XX96
115921	SCHEMATIC, ANTENNA PEDESTAL XX97
124545	SCHEMATIC, ANTENNA PEDESTAL XX96R

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
<48" = ± 1"
<15' = ± 2"
<100' = ± 4"
>100' = ± 6"
INTERPRET TOLERANCING PER ASME Y14.5M - 1994

MATERIAL:

FINISH:

3rd ANGLE PROJECTION

DRAWN BY: MSF
DRAWN DATE: 3-14-07
APPROVED BY:
APPROVED DATE:

Sea Tel®
4030 NELSON AVENUE
CONCORD, CA 94520
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: SCHEMATIC, ANTENNA PEDESTAL

SIZE: B | SCALE: | DRAWING NUMBER: 126374 | REV: A

FIRST USED: XX97B | SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	112657	D	MACHINING, TERMINAL MOUNTING STRIP	
2	1 EA	126865-2	E	PCB ASS'Y, TERMINAL MOUNTING STRIP,	
3	1 EA	112936-36	D1	CABLE ASS'Y, D-SDB, 25 PIN, 36 IN	
5	1 EA	116669-36	B1	CABLE ASS'Y, D-SUB, 9-PIN, 36 IN.	
7	2 EA	121228-3072		STANDOFF, HEX, F/F, 6-32 X .25 OD X .50,	
9	2 EA	114588-146		SCREW, PAN HD, PHIL, 6-32 x 3/8, S.S.	
11	8 EA	114588-107		SCREW, PAN HD, PHIL, 4-40 x 5/16, S.S.	
19	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S.	
29	1 EA	119478-5	C3	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	
30	1 EA	126877	B1	HARNESS ASS'Y, COMTECH MODEM INTE	

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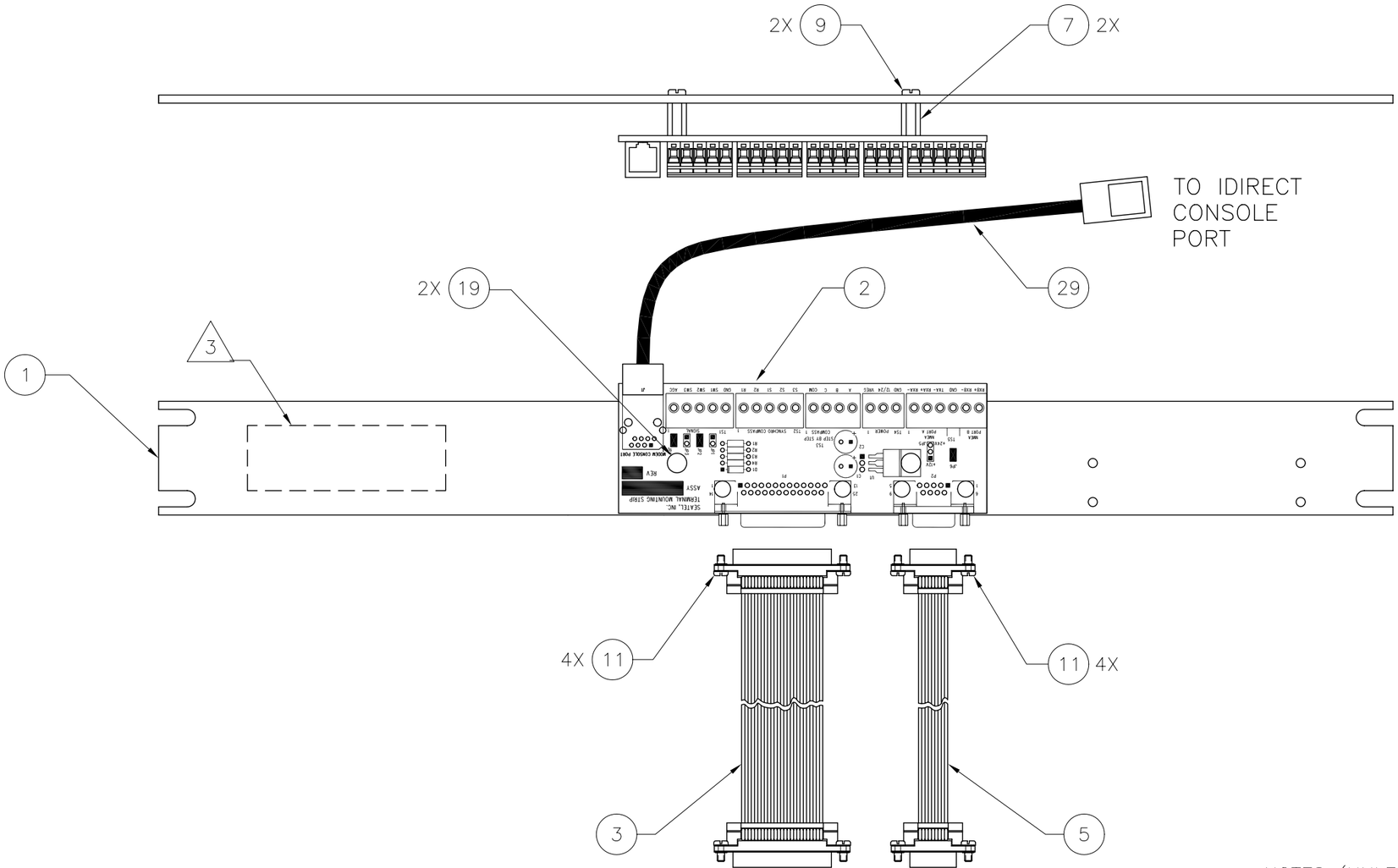
TERMINAL MOUNTING STRIP ASS'Y, ACU

PROD FAMILY	EFF. DATE	SHT 1 OF 1	DRAWING NUMBER	REV
COMMON	29-Sep-08		**121628-4**	**N2**



NOTES (UNLESS OTHERWISE SPECIFIED):

1. APPLY ADHESIVE PER SEATEL SPEC. 121730
2. BAG ITEM 30 AND SHIP WITH PANNEL

-4 SHOWN

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	1/2	121628	N2
		SHEET NUMBER: 3 of 4	

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	116880	F	PANEL MACHINING, RACK, BASE MUX	
2	1 EA	117168-2	L1	MODEM ASS'Y, BASE, 3-CH. 75 OHM	
3	1 EA	117611-4	G	MODEM ASS'Y, BASE, 3 CH. -200, 50 OHM	
4	1 EA	116388	D	BRACKET, CONNECTOR	
5	1 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
6	1 EA	110567-19		ADAPTER, N(F)-N(F), STRAIGHT, FLANGE	
7	1 EA	114972-9	L	CABLE ASS'Y, SMA(M) - SMA(M), 6 IN	
8	1 EA	113303-10	S	CABLE ASS'Y, SMA 90 - SMA (M), 8 IN	
10	4 EA	122569-3402	A	STANDOFF, HEX, M/F, 6-32 X .25 OD X 1.25	
11	8 EA	114588-107		SCREW, PAN HD, PHIL, 4-40 x 5/16, S.S.	
12	8 EA	114583-005		NUT, HEX, 4-40, S.S.	
13	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S.	
14	6 EA	114580-007		WASHER, FLAT, #6, S.S.	
15	4 EA	114588-146		SCREW, PAN HD, PHIL, 6-32 x 3/8, S.S.	
16	8 EA	114580-005		WASHER, FLAT, #4, S.S.	

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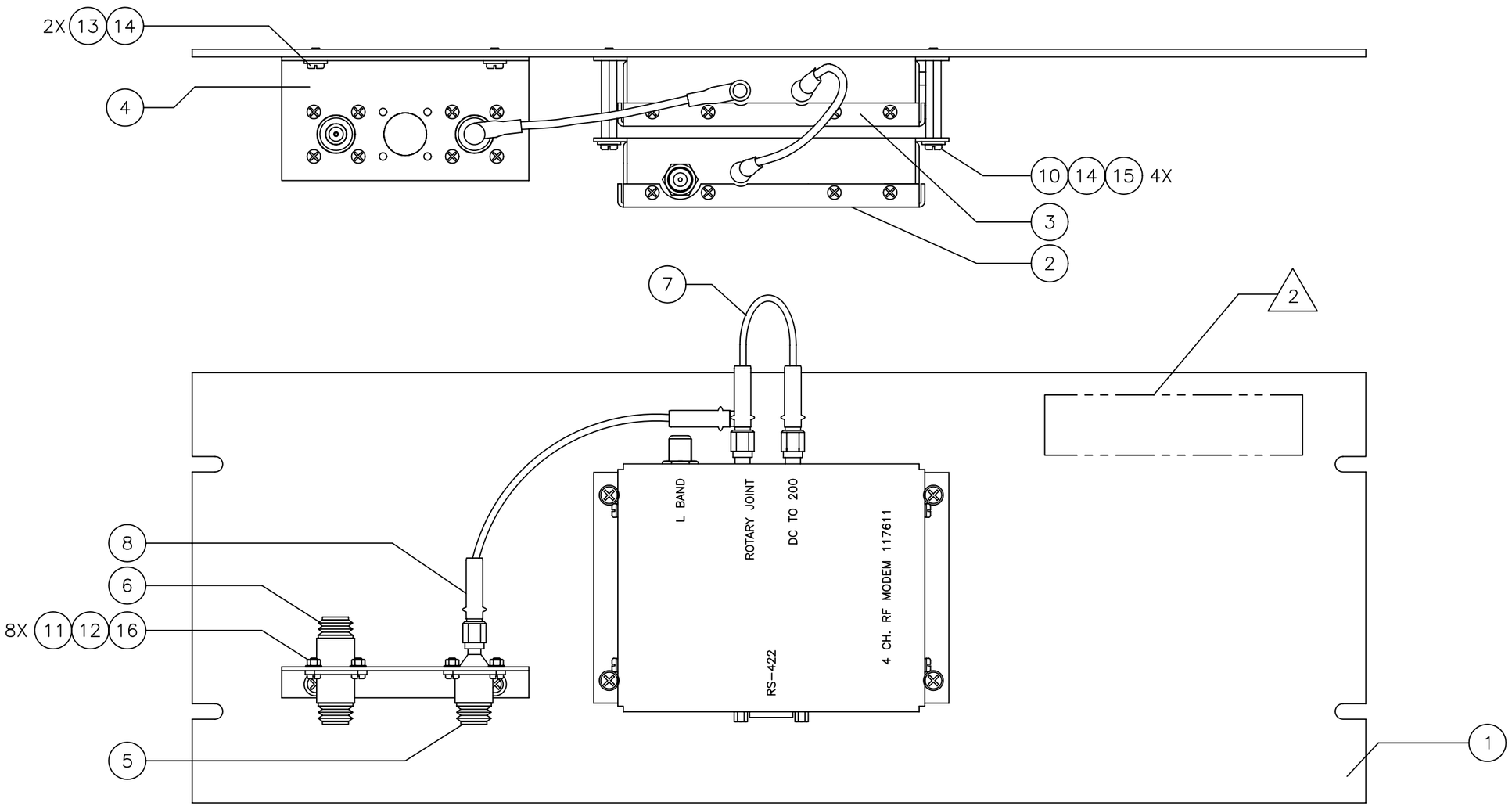
MUX RACK PANEL ASS'Y, RX SS, SF, TX (N/N)

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	20-Nov-07	1 OF 1	**116881-16**	**C**

NOTES:
1. APPLY ADHESIVE PER SEA TEL SPEC. 121730.
2. ATTACH LABEL INDICATING ASS'Y P/N, REV, AND SYSTEM S/N APPROX. WHERE SHOWN.

REV.	ECO#	DATE	DESCRIPTION	BY
A	N/A	1-14-05	RELEASED TO PRODUCTION.	AMN
B	5003	9-21-05	QTY IN ITEM 14 WS 6.	SL
B1	N/A	11-10-05	ITEM 10 WS 114719-15	SL
C	5598	05-16-07	ITEM 13 WS QTY 6; ITEM 14 WS QTY 2; ITEMS 15 & 16 NEW; ADDED NOTE 2; MOVED NOTES; BENT LEADERS ON BALLOONS	RJW



TOLERANCES				
UNLESS OTHERWISE SPECIFIED				
X.X	= ± .050"	SCALE: 1:2	APPROVED BY:	DRAWN BY: MSF
X.XX	= ± .020"	DATE: 11-1-04		DRAWING SIZE: B
X.XXX	= ± .005"	TITLE: MUX RACK PANEL ASS'Y, RX SS, SF, TX (N/N)		
ANGLES	= ± 30'	MODEL:	SHEET: 1 OF 1	DRAWING NUMBER 116881-16 / REVISION C
3rd ANGLE PROJECTION				

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